STIC Search Report
EIC 2800

STIC Database Tracking Number: 155270

TO: Victor Mandala
Location: JEF-4C29
Art Unit : 2826
Thursday, June 16, 2005
Case Serial Number: 10/701,533

From: Jeff Harrison
Location: EIC 2800
JEF-4B68
Phone: 22511

Search Notes

Re: GaSb Substrate, Al semicond. middle layer, wider bandgap energy, photocathode, etc.

Please find attached the search history and the edited search results from patent and nonpatent literature, mostly Chemical Abstracts.

I put the more promising results at the top of the attached pile of results, but I suggest you browse all the results.

If you would like more searching on this case, or if you have questions or comments, please let me know.

Respectfully,
Jeff Harrison

L41 ANSWER 22 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:406595 HCAPLUS

DN 135:186996

TI Noncryogenic quantum **detection** in the mid-IR using InAsSb **photovoltaic** structures

AU Rakovska, Anna; Berger, Vincent; Marcadet, Xavier; Glastre, Genevieve;

SO Proceedings of SPIE-The International Society for Optical Engineering (2000), 4130(Infrared Technology and Applications XXVI), 537-546

AB A mid-IR **photovoltaic detector** using InAsSb as active material, grown by MBE on a GaSb substrate, is described. Quantum **detectors** can offer an alternative to thermal **detectors** (pyroelec. or resistive bolometers) for high temp. (near room temp.) operation. With a 9% Sb content, InAsSb is lattice matched to GaSb and provides a good material quality, with Shockley-Read lifetimes of the order of 200 ns as measured by photoconductive gain measurements as well as time resolved **photocond.** expts. The band gap of InAsSb corresponds to λ = 5 µm at room temp. This makes InAsSb an ideal candidate for room temp. **detection** in the 3-5 µm atm. window. **Photovoltaic** structures are characterized by current-voltage characteristics as a function of temp. Using the absorption value obtained on the test samples, a **detectivity** of 7 × 109 Jones at 3.5 µm is estd. at temp. 250 K, which can easily be reached with Peltier cooling. Considering the **photovoltaic** spectrum, this leads to a NETD <80 mK.

IT Optical **detectors**

IT Band gap

(of noncryogenic quantum IR **detectors** using indium arsenide ntimonide **photovoltaic** structures)

IT **242808-30-6**, Aluminum antimony gallium (Al0.47SbGa0.53)

(noncryogenic quantum **detection** in mid-IR using indium arsenide antimonide **photovoltaic** structures and barrier of)

RN 242808-30-6 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0.47:1:0.53)

Component	Ratio	Component Registry Number
Ga	0.53	7440-55-3
Sb	1	7440-36-0
Al	0.47	7429-90-5

IT **110619-84-6**, Antimony indium arsenide (Sb0.09InAs0.91)

(noncryogenic quantum **detection** in mid-IR using **photovoltaic** structures of)

RN 110619-84-6 HCAPLUS

CN Antimony indium arsenide (Sb0.09InAs0.91) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.91	7440-38-2
Sb	0.09	7440-36-0

IT **12064-03-8**

(substrate; noncryogenic quantum **detection** in mid-IR using indium arsenide antimonide **photovoltaic** structures on)

RN 12064-03-8 HCAPLUS

CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

L41 ANSWER 25 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:265766 HCAPLUS
DN 134:287644
ED Entered STN: 13 Apr 2001
TI Parallel cascade quantum well light emitting device
IN Yang, Rui Q.
PA Maxion Technologies, Inc., USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2001026192	A1	20010412	WO 2000-US27586	20001006
	US 6404791	B1	20020611	US 2000-680317	20001006
PRAI	US 1999-158403P	P	19991007		

AB Semiconductor light-emitting devices are described which comprise a plurality of essentially identical active regions, each such region comprising a plurality of spatially-coupled quantum wells; and injection regions between the active regions which form form type II tunnel junctions between their adjacent active regions so that type II interband transitions occur in the active regions resulting in **photon** emissions. Each active regions may comprise multiple quantum well regions or finite superlattice regions to improve carrier injection efficiency and enhance optical gain. By using type II tunnel junction in the injection regions, carriers can be reused through a spatial interband coupling after an interband transition for **photon** emission, leading to the realization of interband cascade configuration under an appropriate bias.

IT **12064-03-8**, Gallium antimonide **25152-52-7**, Aluminum antimonide **51680-21-8**, Aluminum gallium antimonide arsenide **106603-88-7**, Aluminum gallium antimonide **106603-91-2**, Indium arsenide antimonide (parallel cascade quantum well light-emitting devices)

RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 38 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1998:180599 HCAPLUS

DN 128:224868

TI Semiconductor structures having electrically insulating and conducting portions formed from an AlSb-alloy layer

US 5726462 3/10/98

IN Spahn, Olga B.; Lear, Kevin L.

PA Sandia Corp., USA

AB The semiconductor structure comprises a plurality of semiconductor layers formed on a substrate including ≥1 layer of an AlSb alloy, with at least a part of the AlSb alloy layer being chem. converted by oxidn. to form superimposed elec. insulating and elec. conducting portions. The elec. insulating portion formed from the AlSb alloy layer comprises an oxide of Al (e.g. Al2O3), while the elec. conducting portion comprises Sb. A lateral oxidn. process gives the superimposed insulating and conducting portions below monocryst. semiconductor layers for forming many different types of semiconductor structures having particular utility for optoelectronic devices such as LEDs, edge-emitting lasers, vertical-cavity surface-emitting lasers, **photodetectors** and optical modulators (waveguide and surface normal), and for electronic devices such as heterojunction bipolar transistors, field-effect transistors, and quantum-effect devices. The invention is expected to be particularly useful for forming light-emitting devices for use in the 1.3-1.6 µm wavelength range, with the AlSb alloy layer acting to define an active region of the device and to effectively channel an elec. current for efficient light generation.

IT **25152-52-7 51680-21-8**, Aluminum antimony gallium arsenide **189698-35-9**
(semiconductor structures having elec. insulating and conducting portions formed from AlSb-alloy **layers**)

RN 25152-52-7 HCAPLUS

CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS

CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

RN 189698-35-9 HCAPLUS

CN Aluminum, compd. with antimony and gallium (1:1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0
Al	1	7429-90-5

IT **12064-03-8**
(**substrate**; semiconductor structures having elec. insulating and conducting portions formed from AlSb-alloy layers on)

RN 12064-03-8 HCAPLUS

CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

L41 ANSWER 43 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1996:543949 HCAPLUS
DN 125:183420
ED Entered STN: 12 Sep 1996
TI Semiconductor **photoelectric cathodes** and devices with the **cathodes**
IN Futahashi, Tokuaki
PA Hamamatsu Photonics Kk, Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 08153462	A2	19960611	JP 1994-292983	19941128
	JP 3433538	B2	20030804		
PRAI	JP 1994-292983		19941128		

AB The **cathodes**, which generate electron upon light absorption, and emit the electron by accelerating through external field, contain p-type light-absorbing 1st semiconductor layers (e.g., InGaAs) on semiconductor substrates (e.g., InP), p-type 2nd semiconductor layers (e.g., InP), Schottky electrodes in Schottky contact with, and covering part or the whole of the 2nd semiconductor layers, and having openings, 3rd semiconductor (active) layers having smaller work function than that of the 2nd semiconductor layers, and formed in the openings, and p-type semiconductors (e.g., InP)(channel lattices) buried in the 2nd semiconductor layers and below the Schottky electrodes, and having greater impurity concn. than that of the 2nd semiconductor layers.
IT **Photoelectric** devices
(laminated **cathodes** and devices contg. them)
IT **Cathodes**
(**photoelec.**; laminated semiconductor devices contg.)
IT **12064-03-8**, Gallium antimonide **106603-88-7**, Aluminum gallium antimonide **106603-91-2**, Antimony indium arsenide
RL: DEV (Device component use); USES (Uses)
(semiconductor **photoelec. cathodes** and devices with the **cathodes**)
RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 47 OF 66 HCAPLUS

AN 1994:711117 HCAPLUS
DN 121:311117
ED Entered STN: 24 Dec 1994
TI Tunable IR-diode lasers based on the A3B5 solid solution for the spectral range 2-4 μm
AU Yakovlev, Yu. P.; Baranov, A. N.; Imenkov, A. N.; Popov, A. A.; Sherstnev, V. V.
SO Proceedings of SPIE-The International Society for Optical Engineering (1994), 2112(TUNABLE DIODE LASER SPECTROSCOPY, LIDAR, AND DIAL TECHNIQUES FOR ENVINRONMENTAL AND INDUSTRIAL MEASUREMENTS), 50-61
CODEN: PSISDG; ISSN: 0277-786X
LA English
AB The structures and electroluminescence characteristics of new 2 types of single mode A3B5 semiconductor tunable lasers in the 1.8-3.9 μm spectral range were demonstrated. The 1st type of tunable diode laser based on quaternary solid solns. GaInAsSb and GaAlAsSb lattice matched to GaSb substrate covers 1.8-2.4 μm spectral range. Such tunable 1.8-2.4 μm lasers have single mode or quasi-single mode operation in the **wide** temp. range from 1.6 to 300K. The 2nd type of tunable diode laser based on multiple component InPAsSb/InAsSb lattice matched or mismatched to InAs substrate covers 2.8-3.9 μm spectral range, which was not available for diode laser spectroscopy until now. Such tunable 2.8-3.9 μm lasers have continuous-wave single mode operation up to 100K and pulse operation up to 180K. These lasers can be the key devices for diode laser spectroscopy and sensitive **detection** of pollutants.
IT **12064-03-8**, Gallium antimonide (GaSb) **51680-21-8**, Aluminum gallium antimonide arsenide **106603-91-2**, Antimony indium arsenide (SbInAs)
(tunable IR-diode lasers based on A3B5 solid soln. for spectral range 2-4 μm)
RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 **ANSWER** 45 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1996:469973 HCAPLUS
DN 125:127350
ED Entered STN: 09 Aug 1996
TI Infrared **detector** element substrate with superlattice layers
IN Lee, Myung B.
PA Grumman Aerospace Corp., USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 5536948	A	19960716	US 1994-294635	19940823
PRAI	US 1994-294635		19940823		

AB A substrate upon which IR elements are formed has a cryst. base layer, preferably comprised of silicon; a first strain superlattice layer formed of a plurality of pairs of gallium antimonide and indium arsenide antimonide sublayers upon the base layer; and a first matched superlattice layer formed of a plurality of pairs of gallium antimonide and aluminum antimonide sublayers upon the strain superlattice layer. The strain superlattice layer and the matched superlattice layer mitigate defect propagation from the base layer to the IR **detector** elements. Optionally, a plurality of addnl. or second strain and matched superlattice layers may be formed in an alternating layer configuration upon the first matched superlattice layer so as to achieve enhanced defect filtering.
ST IR **detector** substrate superlattice layer
IT Optical **detectors**
(IR, IR **detector** element substrates with superlattice layers)
IT 12064-03-8, Gallium antimonide **25152-52-7**, Aluminum antimonide **106603-91-2**, Antimony indium arsenide ((Sb,As)In)
RL: DEV (Device component use); USES (Uses)
(IR **detector** element substrates with superlattice layers)
IT **25152-52-7**, Aluminum antimonide **106603-91-2**, Antimony indium arsenide ((Sb,As)In)
RL: DEV (Device component use); USES (Uses)
(IR **detector** element substrates with superlattice layers)
RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

```
     FILE 'REGISTRY' ENTERED AT 12:31:56 ON 16 JUN 2005
L1          166 S  GA.SB/MF OR GA SB/ELF OR GALLIUM ANTIMONIDE
L2          158 S  AS.IN.SB/MF OR AS IN SB/ELF OR ARSENIC
                   INDIUM ANTIMONIDE OR INDIUM ARSENIC ANTIMONIDE
L3          118 S  AL.GA.SB/MF OR AL GA SB/MF OR ALUMINUM
                   GALLIUM ANTIMONIDE OR GALLIUM ALUMINUM ANTIMONIDE
L4           51 S  ALUMINUM/CN OR AL/MF

     FILE 'HCAPLUS' ENTERED AT 12:35:40 ON 16 JUN 2005
L5          460 S  L1(L)(SUBSTRATE OR BASE OR PLATE OR SUPPORT)
L6            6 S  L2(L)?ABSOR?
L7            0 S  L2(L)(ARC OR BARC OR ANTIREFLECT? OR MATTE OR ANTI REFLECT#####)
L8        10004 S  L4(L)SEMICOND######
L9         1986 S  L4(L)(INTERMEDIATE OR INTER OR INTERPOS#### OR INTERLAYER?)
L10         624 S  L4(L)(FILM OR LAYER) AND L4(L)(BETWEEN OR MIDDLE OR CENTER)
L11         112 S  L3(L)(FILM OR INTERPOS? OR INTER OR
                   INTERLAYER? OR LAYER? OR SUBLAYER? OR UNDERLAYER? OR OVERLAYER?)
L12          32 S  L3(L)(ENERGY OR WIDE OR WIDEGAP OR
                   WIDEBAND OR WIDE OR BANDGAP? OR BAND GAP####)
L13           1 S  US20040089860/PN
L14         324 S  51680-21-8,

     FILE 'REGISTRY' ENTERED AT 12:45:21 ON 16 JUN 2005
L15           1 S  25152-52-7/RN

     FILE 'HCAPLUS' ENTERED AT 12:45:22 ON 16 JUN 2005
L16        2711 S  L15
L17         296 S  106603-91-2,

     FILE 'REGISTRY' ENTERED AT 12:45:50 ON 16 JUN 2005
L18           1 S  25152-52-7/RN

     FILE 'HCAPLUS' ENTERED AT 12:45:50 ON 16 JUN 2005
L19        2711 S  L18
L20          29 S  L5 AND (L8 OR L9 OR L10 OR L11 OR L12)
L21           0 S  L10 AND (L11 OR L12)
L22           3 S  L14 AND L16 AND L17 AND L19
L23                SEL PLU=ON  L13 1- NCL IC FTERM :        5 TERMS
L24          47 S  L1 AND L2 AND L3
L25         541 S  L23
L26           1 S  (L14 AND L17 AND L16) AND L25
L27           1 S  L14 AND L16 AND L19 AND L25
L28           1 S  L16 AND L17 AND L19 AND L25
L29           3 S  L14 AND L16 AND L17
L30           3 S  L14 AND L16 AND L17
L31          18 S  L14 AND L16 AND L19
L32           3 S  L14 AND L17 AND L19
L33          28 S  L15 AND L17 AND L19
L34         139 S  L6 OR L12 OR L13 OR L20 OR L22 OR L24 OR
                   (L26 OR L27 OR L28 OR L29 OR L30 OR L31 OR L32 OR L33)
L35           4 S  L24 AND WIDE#######
L36          11 S  L34 AND WIDE#######
L37          30 S  L34 AND ENERGY(4A)(GAP OR BAND OR BANDGAP)
L38          21 S  L34 AND ?DETECT?
L39          31 S  L34 AND PHOTO#########
L40           5 S  L34 AND ?CATHODE?
L41          66 S  L6 OR L22 OR (L26 OR L27 OR L28 OR L29 OR
                   L30) OR L32 OR (L35 OR L36 OR L37 OR L38 OR L39 OR L40)
L42      101014 S  PHOTODETECT? OR PHOTOCATH? OR PHOTOSENS?
L43          56 S  (L25 OR L26 OR L27 OR L28 OR L29 OR L30 OR
                   L31 OR L32 OR L33 OR L34) AND L42
L44          51 S  L43 NOT L41
L45           3 S  L44 AND WIDE?
L46           3 S  L44 AND LARGER?
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L41 ANSWER 28 OF 66 HCAPLUS

AN 2000:334161 DN 133:24422

TI Mid-IR InAsSb **photovoltaic detectors**

AU Rakovska, Anna; Berger, Vincent; Marcadet, Xavier; Glastre, Genevieve; Vinter, Borge; Bouzehouane, K.; Kaplan, Daniel; Oksehendler, T.

SO Proceedings of SPIE-The International Society for Optical Engineering (2000), 3948(Photodetectors: Materials and Devices V), 55-62

AB We describe a mid-IR **photovoltaic detector** using InAsSb as active material, grown by MBE on a GaSb substrate. The purpose of this study is to show that quantum **detectors** can offer an alternative to thermal **detectors** for high temp. operation. With a 9% Sb content, InAsSb is lattice matched to GaSb and thus provides an excellent material quality, with Shokley-Read lifetimes of the order of 200 ns as measured by photoconductive gain measurements as well as time resolved **photocond.** expts. The band gap of InAsSb corresponds to a wavelengths as well as time resolved **photocond.** expts. The band gap of InAsSb corresponds to a wavelength of 5 μm at room temp. This makes InAsSb an ideal candidate for room temp. **detection** in the 3-5 μm atm. window. **Photovoltaic** structures are characterized by current voltage characteristics as a function of temp. Using the absorption value obtained on the test samples, a **detectivity** of 7x109 Jones can be obtained at a temp. of 250 K, which can easily be reached with Peltier cooling. This leads to a NETD lower than 80 mK.

IT **12064-03-8**, Gallium antimonide **106603-91-2**, Antimony indium arsenide ((Sb,As)In) **110619-84-6**, Antimony indium arsenide (Sb0.09InAs0.91) **117944-40-8**, Aluminum gallium antimonide (Al0.5Ga0.5Sb) **242808-30-6**, Aluminum, compd. with antimony and gallium (0.47:1:0.53)
(mid-IR InAsSb **photovoltaic detectors**)

RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

RN 110619-84-6 HCAPLUS
CN Antimony indium arsenide (Sb0.09InAs0.91) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.91	7440-38-2
Sb	0.09	7440-36-0

RN 117944-40-8 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.5:1:0.5)

Component	Ratio	Component Registry Number
Ga	0.5	7440-55-3
Sb	1	7440-36-0
Al	0.5	7429-90-5

RN 242808-30-6 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.47:1:0.53) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.53	7440-55-3
Sb	1	7440-36-0
Al	0.47	7429-90-5

Mid-IR InAsSb photovoltaic detectors

Anna Rakovska, Vincent Berger, Xavier Marcadet, Geneviève Glastre, Borge Vinter
Laboratoire Central de Recherches THOMSON-CSF, Domaine de Corbeville, F-91404 ORSAY, FRANCE
K. Bouzehouane[a)], D. Kaplan, T. Oksehendler
ALLIAGE, X Pole, Ecole Polytechnique, F-91128 PALAISEAU, FRANCE

ABSTRACT

We describe a mid-IR photovoltaic detector using InAsSb as active material, grown by MBE on a GaSb substrate. The purpose of this study is to show that quantum detectors can offer an alternative to thermal detectors (pyroelectric or resistive bolometers) for high temperature (near room temperature) operation. With a 9% Sb content, InAsSb is lattice matched to GaSb and thus provides an excellent material quality, with Shokley-Read lifetimes of the order of 200 ns as measured by photoconductive gain measurements as well as time resolved photoconductivity experiments. The band gap of InAsSb corresponds to a wavelength of 5 microns at room temperature. This makes InAsSb an ideal candidate for room temperature detection in the 3-5 microns atmospheric window. Photovoltaic structures are characterized by current voltage characteristics as a function of temperature. Using the absorption value obtained on the test samples, a detectivity of $7X10^9$ Jones can be obtained at a temperature of 250 K, which can easily be reached with Peltier cooling. This leads to a NETD lower than 80 mK.

Keywords: InAsSb, IR-detector, lifetime, GaSb, MBE

1. INTRODUCTION

Antimonide based materials have a strong potential for the development of mid infrared devices such as lasers or detectors operating between 2 and 5 µm. Applications in this spectral range are found in various domains such as pollutant detection, infrared thermal imaging, lidars or optical countermeasures. The knowledge of the material's intrinsic characteristics such as band gap and band offsets is critical for the design of these devices, and their performances depend directly on the effective lifetime. In the case of $InAs_{1-x}Sb_{x\sim0.09}$ nearly lattice matched to GaSb, the band gap around 5 µm and the small effective mass lead to an intrinsic carrier density of the order of a few $10^{15}cm^{-3}$ at room temperature. This typical carrier density is sufficiently low for neglecting intrinsic Auger recombination [1]. At low optical excitation, the effective lifetime is likely to be dominated by nonradiative Shockley-Read recombination, and is therefore a direct indication of the material quality.

We present first band gap and lifetime measurements on a series of test samples of MBE grown InAsSb closely lattice matched to a GaSb substrate. The gap is deduced from absorption, photoluminescence and photoconductivity spectra. Photoconductivity gain measurements and time resolved photoconductivity lead to the effective lifetime determination.

Based on a similar structure as the test samples, an $InAs_{0.91}Sb_{0.09}$ p-i-n photovoltaic mid infrared detector is reported. It has been characterized by I(V) measurements as a function of temperature. The mechanism limiting the detectors performances has been established.

[a)] Present address : Unité Mixte de Physique CNRS-Thomson, Domaine de Corbeville, 91404 ORSAY, FRANCE

The paper is structured as follows. Section 2 gives an overview of the growth conditions and the description of the test sample structure. Section 3 focuses on the spectral characterization, yielding the room temperature gap around the lattice matching Sb concentration in InAsSb. In section 4 lifetime measurements by two different methods are presented and the consequences on an InAsSb based detector explained. Finally, the characteristics of a photovoltaic detector are shown in section 5.

2. PHOTOCONDUCTIVE SAMPLE DESCRIPTION

2.1. MBE growth

The samples were grown in a RIBER-32 MBE system with a Reflection High Energy Electron Diffraction (RHEED) facility. The As flux is calibrated from the (2x4) to (4x2) surface reconstruction transition on a GaAs (100) substrate [2] whereas Sb-limited RHEED oscillations on GaSb substrates are used to accurately determine the Sb flux. High Resolution X-Ray Diffraction (HXRD) measurements in the vicinity of the (004) reflection were used for composition determination, taking into account strain effects. The $InAs_{1-x}Sb_x$ layers were found to be lattice matched for x=0.089.

2.2. Test sample structure

The band structure of a typical photoconductive sample in thermal equilibrium at room temperature is shown in figure 1. This calculation is based on the numerical resolution of Poisson's equation, taking into account the Fermi distribution of the carriers. Band offset values, electron and hole masses and other physical parameters were taken from the literature [3-6] or extracted from photoconductivity and photoluminescence measurements. When the necessary parameters for ternary or quaternary compounds were not directly available, linear interpolation was used. The boundary conditions at the free surface were set by positioning the bands relative to the Fermi level of a bulk material of the same doping. This choice does not take into account Fermi level pinning at the free surface. Since its value is not known in these materials, we have not tried to improve the model on this point.

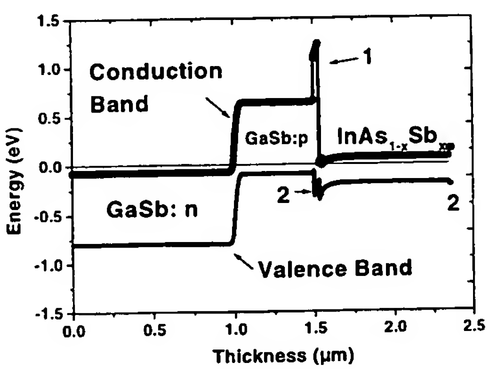

Figure 1. Band structure simulation of a test sample at 300 K. The Fermi level is the zero energy. A n.i.d. GaSb p buffer is grown, followed by a 30 nm $Al_{0.47}Ga_{0.53}Sb$ confining barrier for electrons (1), and a 18 nm $In_{0.85}Al_{0.15}As_{-0.9}Sb_{-0.1}$ barrier for holes (2). The lattice matching condition for $InAs_{1-x}Sb_x$ is obtained for x=0.089. The finishing layer is also $In_{0.85}Al_{0.15}As_{-0.9}Sb_{-0.1}$ (2).

The structure was grown on a n.i.d. p-type 0.5 µm thick GaSb buffer. The GaSb/$InAs_{1-x}Sb_x$ interface is known to be semimetallic [5] causing electron transfer into the $InAs_{1-x}Sb_x$ layer, from the valence band of GaSb. This might disturb some characterization measurements such as photoluminescence or photoconductivity. In order to reduce the carrier population at the semimetallic interface, a barrier made of 30 nm of $Al_{0.47}Ga_{0.53}Sb$ and 18 nm of $In_{0.85}Al_{0.15}As_{-0.9}Sb_{-0.1}$ was grown between the $InAs_{1-x}Sb_x$ layer and the GaSb buffer.

2.3. Contacting

For the purpose of photoconductivity measurements, 3 mm long TiPtAu contacts were evaporated at a distance of 0.291 mm from each other on the epitaxial layer, after a deoxidation step. No annealing was performed. The contact resistivity measured using the Transmission Line Model (TLM) was established to be of the order of 7×10^{-5} $\Omega.cm^2$.

3. OPTICAL SPECTRAL CHARACTERIZATIONS

The purpose of this section is to provide a full spectral characterization of this material system at room temperature and demonstrate its suitability for the use in mid-IR detection. Absorption, photoconductivity and photoluminescence experiments were carried out, compared and analyzed in the light of theoretical simulations.

3.1. InAsSb absorption: measurement and calculation

A transmission measurement was performed on a sample with a Sb content of 0.09, using a MagnaIR 860 Nicolet Fourier Transform spectrometer and its internal black body source. The absorption was deduced by normalizing the transmission of the sample with a bare substrate transmission spectrum. The resulting spectrum is in remarkably good agreement with the theoretical simulation of the absorption of a 800 nm InAsSb layer at room temperature (figure 2), based on a 2X9-band **k.p** calculation. This method assures the inclusion of bands of all symmetries necessary for describing the anisotropy of the heavy hole band with inclusion of the spin-orbit interaction [7]. We have adjusted the p matrix elements, other than those known from the literature [8], to obtain what we consider the best description of the band structure around the zone center of InAs and InSb. The parameters for $InAs_{0.91}Sb_{0.09}$ where then derived by linear interpolation, except for the fundamental gap and the spin-orbit splitting for which measurements show a parabolic dependence [9]. The $InAs_{0.91}Sb_{0.09}$ band structure around the zone center and the corresponding wave functions were then calculated. Optical matrix elements were deduced from these wave functions and the absorption was calculated from the standard formula [10]:

$$\alpha = \frac{q^2 \pi Z_0}{\sqrt{\varepsilon_r}\, m_0^2\, \omega} \frac{1}{\Omega} \sum_{k,i,f} |\langle k,f|\eta \cdot p|k,i\rangle|^2 \delta(\varepsilon_f(k) - \varepsilon_i(k) - \hbar\omega) f_i(k)(1 - f_f(k)) \tag{1}$$

in which Z_0 is the vacuum impedance 377Ω, ε_r the relative permittivity and η the polarization direction of the electrical field. The sum is over all transitions from states in the initial band i to the final state band f, and f_i and f_f are the occupation probabilities of the states at room temperature. The calculation of this expression has fully taken into account the dependence on **k** of all the terms in the sum. The absorption of a 800 nm thick layer of $InAs_{0.91}Sb_{0.09}$ was found to be roughly 30% at 3.39 μm, corresponding to an absorption coefficient of 4606 cm^{-1}, as calculated by the **k-p** method. This result will be necessary for the estimation of lifetime by photoconductivity measurements.
As expected for small gap materials, the non parabolicity of the bands results in a rather linear shape at high energies, which justifies the need of this elaborate calculation. Note that in the case of a non-lattice matched material (x≠9%), the influence of strain should be taken into account to obtain a similar level of agreement between theoretical predictions and experimental absorption spectra.

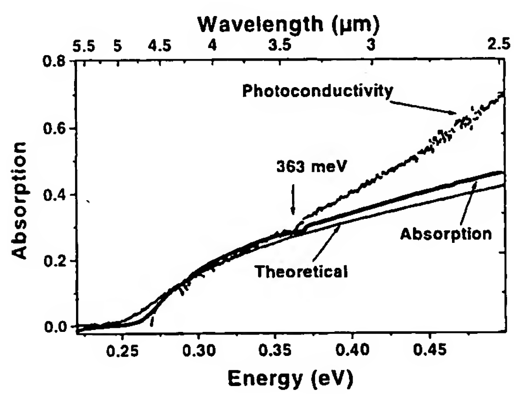

Figure 2. 800 nm thick $InAs_{0.91}Sb_{0.09}$ absorption obtained from a normalized transmission experiment is in very good agreement with the theoretical simulations. The photoconductivity curve shown has been multiplied by the photon energy, yielding the product of the absorption and the photoconductivity gain G. A second band edge at 363 meV is attributed to the cap layer of InAlAsSb.

3.2. Spectral photoconductivity

Spectral photoconductivity provides an alternative way of measuring the band-to-band absorption. Moreover it leads to a more accurate determination of the band gap, because free carrier absorption does not contribute to the photocurrent. The

spectral photoconductivity measurements were carried on with the FTIR beam from the blackbody, focused by a parabolic mirror between the two TiPtAu contacts. The resulting spectra were normalized by the blackbody spectrum measured with a pyroelectric detector at a very low Michelson mirror speed, to ensure linearity of the detector's response. Since the responsitivity is $R(A/W)=\alpha qG/h\nu$ with α the absorption and G the gain, the spectra were multiplied by $h\nu$, in order to be compared to the absorption obtained in the transmission experiment. The result is shown in figure 2.

The photoconductivity spectrum displays an additional absorption edge at 363 meV, above the energy gap of $InAs_{0.91}Sb_{0.09}$. This can be attributed to absorption in the InAlAsSb layers. A similar value was found by energy activation measurements, confirming this interpretation. The gap of 363 meV was then used for $In_{0.85}Al_{0.15}As_{\sim0.9}Sb_{\sim0.1}$ in the simulations (figure 1). Note that it is a few tens of meV lower than the extrapolated value reported in [5] at 0 K. Because the InAlAsSb feature is much stronger on photoconductivity spectra, in comparison with absorption spectra, it can be deduced that the photoconductive gain is greater for charges absorbed in the InAlAsSb layers, possibly due to charge separation in built-in electric fields. Thus the photocurrent generated in the thin InAlAsSb layers is magnified and made visible in the background signal of the 800 nm thick layer of $InAs_{0.91}Sb_{0.09}$. The InAlAsSb layers (15 times thinner than the InAsSb layer) are naturally less visible on the absorption spectrum. Even so, a slight increase in respect with the theoretical curve can be noticed in this region.

3.3. Photoluminescence and quaternary barrier gap determination

Photoluminescence at 300K was used as a further probe for the gap energy and as a qualitative indication of the lifetime. The excitation source was a 0.98 µm, broad angle laser diode operating at up to 60 mW averaged over a duty cycle of 50%. The sample was positioned at ~ 1 mm from the diode with an angle of incidence of the pump beam of roughly 60°. Since no focusing of the pump beam was used, the divergence of the laser diode led to an illuminated surface of a few mm^2, corresponding to a carrier density always lower than $10^{16}cm^{-2}$. The photoluminescence was collected by an f 0.8 Germanium lens that also served as a filter for the 0.98 µm pump. The collected beam was collimated into the FTIR spectrometer, and measured with a MCT detector. The spectrometer was operated in a step scan mode and the external lock-in amplifier was triggered at the diode frequency of 70 kHz. With a resolution of 32 cm^{-1}, the acquisition time for one spectrum was typically 10 minutes.

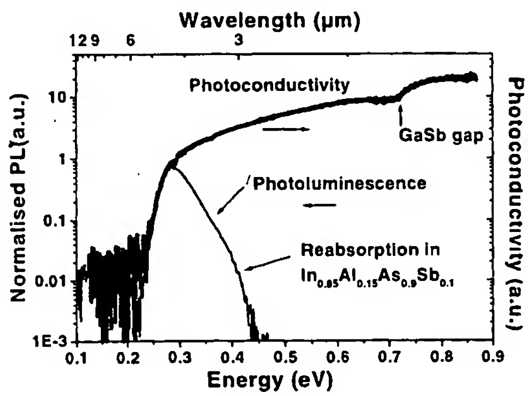

Figure 3. Photoluminescence and photoconductivity low energy edges superpose well, pointing to a band-to-band recombination mechanism. Reabsorption of PL from $InAs_{0.91}Sb_{0.09}$ in InAlAsSb is apparent on the high energy side of the PL peak. Photocurrent originating in the GaSb substrate is present above 700 meV, giving evidence for the thermal activation of the InAlAsSb barrier for holes. The photoconductivity spectrum is the same as the one shown on figure 2.

Figure 3 shows a good agreement of the low energy side of photoconductivity and PL spectra at 300K. This is a strong indication that our PL spectra are dominated by band-to-band recombination mechanism. In further support of this interpretation, we observe a high energy exponential decay corresponding to electronic temperatures of roughly 350 K. We have evidence that it is the excitation wavelength, rather than the power that is responsible for this electron heating. The change in electronic temperature was smaller than the experimental error (a few K) as the pump power was increased by 2 orders of magnitude, whereas a temperature as low as 325 K is obtained when operating at 1.55 µm. Ideally this experiment should be performed with a ~2.5 to 3 µm diode, unfortunately not commercially available. Figure 3 also shows a clear change in the exponential tail slope around 400 meV, two orders of magnitude below the peak maximum. We believe this to be due to the InAlAsSb layer whose gap energy of 363 meV was deduced from photoconductivity (figure 2). This shoulder in the PL spectrum results from reabsorption in InAlAsSb of high energy luminescence from $InAs_{0.91}Sb_{0.09}$.

3.4. Conclusion

This section demonstrates clearly that InAsSb lattice nearly lattice matched to a GaSb substrate is spectrally well suited for room temperature detection in the 3-5 atmospheric window.

4. LIFETIME MEASUREMENTS

4.1. Photoconductivity gain measurements

Photoconductivity gain measurements allowing lifetime calculation were carried out at room temperature. The photoresponse was measured under a field of 2.82 V/cm and a 3.39 µm HeNe laser beam. The illumination intensity distribution between the contacts was precisely deduced from the beam's gaussian shape, carefully mapped by a pyroelectric detector. The beam power was modulated by a polariser from 0 to 0.8 mW, and the photocurrent was deduced from a voltage lock-in measurement across a 50 ohm resistor (R_{charge}) mounted in series with the sample. The photoresponse is independent of the modulation frequency and linear with the illumination power, as can be seen from the inset of figure 5. This enables us to extract a photoconductive gain G related to the lifetime τ of the carriers by $G=\mu E\tau/l$, where μ is the carrier mobility, E the electric field and l the distance between contacts. The gain was found to be linear with the electric field up to 3 V/cm.

The expression of the lifetime is:

$$\tau=\frac{1}{\alpha}\left(1+\frac{R_{charge}+R_{wire}}{R^{0}_{sample}}\right)^{2}\left[\frac{\Delta V_{signal}/V_D}{\mu\eta}\right]\left(\frac{R_D A_D l^2 .\frac{1.2395}{\lambda(\mu m)}}{R_{charge}A_E V_{pol}}\right) \qquad (3)$$

ΔV_{signal} is the lock-in signal under illumination. The beam power is deduced from V_D: the voltage across the detector, its response R_D and surface A_D. The electrical resistances in series with the dark material resistance R^0_{sample} are R_{wire} and R_{charge}. A_E is the illuminated surface between two contacts and l - the distance between contacts. η is a geometrical correction factor due to the non uniform energy density in the beam. The absorption α was taken equal to 30%, according to the experimental and theoretical results presented in the previous section.

Mobility is another key parameter. Its direct measurement by a Hall effect experiment was not possible for two reasons. First, the presence of the electron 2D gas, in addition to the 3D intrinsic carrier density in $InAs_{0.91}Sb_{0.09}$, complicated the interpretation of Hall measurements. The second reason is that the valence band InAlAsSb barrier was found to be thermally activated at room temperature. This fact was shown for instance by Hall measurements as a function of temperature on samples grown on p-type substrates. A photoconductivity signal at the GaSb gap energy (700 meV) (figure 3) gives further proof of the presence in $InAs_{0.91}Sb_{0.09}$ of charges photocreated in GaSb. Due to the difficulty of measuring the mobility, we have adopted the literature value for InAs : 30 000 cm^2/V/s [3]. This choice may be subject to discussion and introduces an uncertainty in the lifetime calculated by equation (3).

It should be noted that the excitation source at 3.39 µm was below the energy gap of GaSb. Consequently the totality of the photocurrent originates from $InAs_{0.91}Sb_{0.09}$. In addition, as the mobility of electrons is between 2 and 3 orders of magnitude greater than the mobility of holes, the photocurrent is due to electrons.

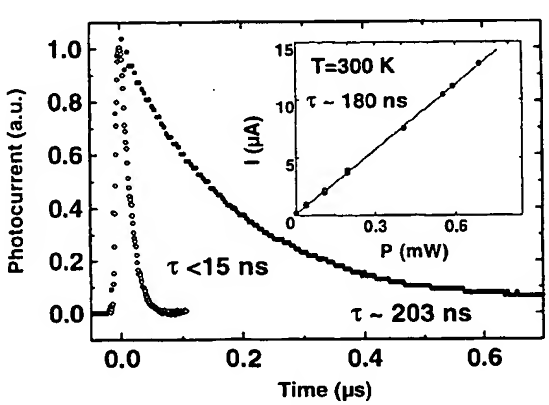

Figure 4. Time resolved photoconductivity measurements at 300 K using a 3.39 µm OPO source. The effective lifetime is deduced from a monoexponential fit of the photocurrent decay. The resolution limit of the experiment set-up is less than 15 ns. The longest lifetime is ~200 ns (x = 12.5%) and was obtained on the same sample used in the DC photoconductivity measurement shown in the inset of the figure. In that case, the lifetime is deduced from the slope of the curve.

4.2. Time resolved photoconductivity measurements

Time resolved photoconductivity measurements were performed at room temperature using a pulsed optical parametric oscillator (OPO) as pump source. This additional experiment is important to validate the results obtained by photoconductive gain measurements, especially because of the tentative value of the mobility. The OPO used $LiNbO_3$ as non linear crystal, and was tuned to 3.39 µm, the same wavelength as for gain measurements. The output power of the 15 ns pulses was 3 mJ per pulse; therefore a strong attenuation was needed to avoid high level photoexcitation and related Auger recombination. The electrical setting was identical to the one used in DC photoconductivity, and the lock-in amplifier was replaced by a rapid digital oscilloscope. Figure 5 shows the exponential decay of the photocurrent for two samples. The poor quality sample gives the resolution limit of the experimental set up : it is less than 15 ns. Lifetimes as high as 200 ns were obtained for good quality samples. For all samples the time resolved experiments were in very good agreement with lifetimes obtained by the photoconductive gain measurements.

4.3. Nature of the lifetime

The best lifetime was obtained for a slightly relaxed sample with 12.7% of Sb content. Therefore relatively low dislocation density is not an obstacle to high lifetime . The key parameters are essentially growth related and include the substrate temperature, the use of dimer or tetramer for As and Sb, and the relative fluxes of the V elements during deposition.

The poorest lifetime was obtained for a sample at x=14.4%. Auger mechanisms are clearly not possible at this level of excitation [1]. Moreover, we found the calculated radiative lifetime in intrinsic $InAs_{0.91}Sb_{0.09}$ to be 1.6 µs, significantly higher than 200 ns. Shockley-Read recombination seems most plausible. The value of 200 ns is the highest reported in the literature, to the best of our knowledge and points to an excellent material quality.

4.4. Carrier lifetime and mid IR-detection

The lifetime is a material parameter of great importance in a detection devices. It is a direct measurement of the generation –recombination rate in the detection layer. Generation-recombination being a source of noise, a long lifetime is highly advantageous. It can be shown, using the obtained value of 200 ns in InAsSb that the generation recombination noise is dominant over the Johnson noise at 300 K in photoconductive detectors, given an applied internal field of the order of 100 V/cm^2. At this temperature, It is also found to be substantially more than the noise induced by background radiation. All this shows the importance of a long lifetime, which in this case is limited by the quality of the InAsSb material.

5. PHOTOVOLTAIC DETECTOR

5.1. Detector structure

A photovoltaic p-i-n detector was grown, based on the structure shown in figure 1. The InAsSb detection layer was 1 µm thick and left undoped, to keep the generation recombination noise at its intrinsic level, given by the lifetime of 200 ns measured on the test samples. Barriers 1 and 2 were doped respectively P and N, at an extrinsic concentration of $1\times10^{18}cm^{-3}$. In addition to leaving InAsSb free of extrinsic doping, these barriers help to reduce the diffusion currents across the structure. The latter are an additional source of noise. The p-doped $Al_{0.5}Ga_{0.5}Sb$ confines electrons and the n-doped $In_{0.85}Al_{0.15}As_{0.9}Sb_{0.1}$ is aimed at stopping hole diffusion.

The photovoltaic detector consists of a 150X150µm mesa obtained by ion beam etching from the cap layer down to the GaSb buffer. The GaSb surface is then chemically treated in a H_2SO_4:H_2O_2:H_2O solution. The substrate is etched to allow illumination from the P side.

5.2. Detector characterization

Dark I(V) measurements are an important characterization technique. They give access first to the R_0A, that is the product of dark resistance and detector surface, and also to the ideality factor which is characteristic of the nature of the dominating noise inducing mechanism.

The value of R_0A is a direct probe of the noise level in the detector. In the case of a generation-recombination dominated noise regime, the R_0A is related to the previously measured lifetime by $R_0A = 2\frac{kT\tau}{e^2 d n_i}$, where d is the thickness of the active InAsSb layer and n_i the intrinsic carrier density equal to 5×10^{15} cm^{-3} at 300 K. According to this formula, an R_0A of the order of 10 Ωcm^2 is expected.

The I(V) characteristic of this detector is rectifying. It was measured as a function of temperature between 77 K and 290 K and yielded an R_0A of 0.127 Ωcm^2 at 290 K and 0.967 Ωcm^2 at 250 K. These values are substantially less than the R_0A previously calculated using a lifetime of 200 ns. This is a first indication that the generation-recombination noise might not be dominant.

The ideality factor was deduced from a linear fit of the logarithm of the I(V) characteristic. This fit was carried out in a voltage range equivalent to less than half the value of the gap, to avoid the influence of possible tunneling mechanism. Values of the order of 1 have been measured between 120 and 290 K as can been seen from the inset of figure 5. This points to a diffusion dominated current.

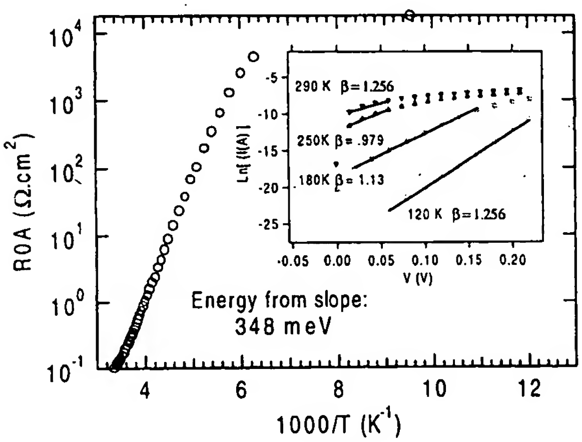

Figure 5. R_0A as a function of temperature, obtained from I(V) measurements, such as those shown in the inset. An activation energy value of 343 meV is deduced from the slope of the curve. The linear fit of the logarithm of the I(V), for voltage values equivalent to less than half the gap energy yield the ideality factor at temperatures ranging from 120 to 290 K.

Further evidence in support of a diffusion mechanism, limiting the noise of this detector is given by the variation of the R_0A with temperature, shown in figure 5. The R_0A is found to be exponentially activated at high temperature. The activation energy measured in figure 5 is of 349 meV. This energy is consistent with the gap energy of 363 meV of the quaternary InAlAsSb barrier, established in section 3 by photoluminescence and photoconductivity measurements on the test samples. This suggests that the diffusion of holes above the InAlAsSb barrier is the limiting mechanism in this device.

Assuming a quantum efficiency of the order of 30 %, based on the absorption measurements on the test samples, a detectivity of 2×10^9 Jones at 290 K and 7×10^9 Jones at 250 is expected, based on the experimental values of R_0A. Integration of the spectral detectivity over the blackbody emission leads to a Noise Equivalent Temperature Difference NETD lower than 100 mK, for a 50X50μm pixel and at f/1. This is in the performance range of thermal detectors.

6. CONCLUSION

$InAs_{1-x}Sb_{0.07<x<14.4}$ material properties, critical for new optoelectronic applications in the 3 to 5 μm region have been thoroughly studied. The experimental absorption was found to be in very good agreement with the theoretical calculations, thus validating the model and the parameters used. The gap of InAsSb nearly lattice matched on GaSb was established to be very well suited for IR detection in the 3-5 μm range. Moreover, the gap of the InAlAsSb cap layer was measured, by photoluminescence and spectral photoconductivity experiments.

The high quality of the material was demonstrated with effective carrier lifetimes as high as 200 ns, confirmed by two different measurement techniques. This lifetime is likely to result from dominating Shockley-Read recombination

processes. Its high value is very promising for a InAsSb detector, in the case of dominant generation-recombination processes.

A photovoltaic p-i-n InAsSb detector was grown. Its performances at 300K are consistent with a limiting current of holes diffusing through the InAlAsSb barrier. The resulting R_0A decreasing exponentially with temperature, moderate Peltier cooling is of interest. The design can be improved by increasing the gap of the corresponding n doped barrier for holes to achieve a generation recombination regime.

ACKNOWLEDGMENTS

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L41 ANSWER 24 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:340812 HCAPLUS
DN 134:318460
ED Entered STN: 14 May 2001
TI **Photovoltaic detector**
IN Berger, Vincent; Marcadet, Xavier; Rakovska, Ana
PA Thomson CSF, Fr.

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	FR 2800201	A1	20010427	FR 1999-13359	19991026
	FR 2800201	B1	20030704		
PRAI	FR 1999-13359		19991026		

AB The **photovoltaic detector** comprises a stack of ≥3 layers with a layer nonintentionally doped or weakly doped comprised between a p-doped layer and a n-doped layer, connection electrodes manufd. on the p- and n-doped layers, and a device for **detection** of current to the connection electrodes. In the **detector** the p-doped layer presents a barrier in the conduction band and does not present or partially presents a barrier in the valence band, the n-doped layer presents a barrier in the valence band and does not present or presents partially a barrier in the conduction band.

IT **25152-52-7**, Aluminum antimonide **106603-88-7**, Aluminum gallium antimonide **106603-91-2**, Antimony indium arsenide
(**photovoltaic detector**)

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 16 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2003:81886 DN 138:329159

ED Entered STN: 03 Feb 2003

TI Epitaxial ternary and quaternary III-V antimonide substrates

AU Mauk, Michael G.; Cox, Jeffrey A.; Sulima, Oleg V.; Datta, Sarbajit;

SO Proceedings - IEEE Lester Eastman Conference on High Performance Devices, **Newark, DE, United States, Aug. 6-8, 2002 (2002), 213-222 Publisher:** Institute of Electrical and Electronics Engineers, New York, N. Y. CODEN: 69DMW8; ISBN: 0-7803-7478-9

AB Modified liq.-phase epitaxy (LPE) techniques can be adapted for the growth of relatively thick (50-500 μm) epitaxial layers of ternary and quaternary III-V antimonide alloys, including InAsSb, InGaSb, AlGaAsSb, InGaAsSb, and InAsSbP. These structures can function as virtual substrates with adjustable lattice consts. for epitaxy of various optoelectronic devices such as mid-IR **photodiodes**. A variety of substrate structures can be realized either by effecting gradual, continuous compositional grading of thick epilayers, or by growing multilayers with abrupt but incremental compositional changes between adjacent layers. Both approaches can be combined with selective removal of the seeding substrate and wafer bonding techniques. Low-defect alloy substrates with increased functionality, and with lattice consts. and bandgaps significantly different than available with binary compd. wafers (e.g., InAs or GaSb), appear feasible.

IT 12064-03-8
(LPE of ternary and quaternary III-V antimonide substrates)

RN 12064-03-8 HCAPLUS

CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

IT 51680-21-8, Aluminum antimony gallium arsenide 106603-91-2
(LPE of ternary and quaternary III-V antimonide substrates)

RN 51680-21-8 HCAPLUS

CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS

CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

RN 107068-00-8 HCAPLUS

CN Antimony indium arsenide (Sb0.2InAs0.8) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.8	7440-38-2
Sb	0.2	7440-36-0

RN 111706-54-8 HCAPLUS

CN Antimony indium arsenide (Sb0.15InAs0.85) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.85	7440-38-2
Sb	0.15	7440-36-0

RN 125082-86-2 HCAPLUS

CN Antimony indium arsenide (Sb0.07InAs0.93) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.93	7440-38-2
Sb	0.07	7440-36-0

L41 ANSWER 20 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:713730 HCAPLUS
DN 135:264367
ED Entered STN: 28 Sep 2001
TI Multicolor **detector** for a semiconductor structure
IN Razeghi, Manijeh
PA Mp Technologies Llc, USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2001071813	A1	20010927	WO 2001-US5175	20010216
	US 6452242	B1	20020917	US 2000-534234	20000323
PRAI	US 2000-534234	A	20000323		

AB Multicolor **photodetectors** are described which comprise a heterostructure with a substrate, a lower contact layer, a single active region and an upper contact layer, each of the upper and lower contact layers having a bandgap; the active region having a bandgap different from the bandgap of the lower and upper contact layers; and the active region being lattice-matched to each of the upper and lower contact layers. The upper and lower contact layers are preferably formed from AlInSb or GaInSb. The active region is preferably formed from InAsSb, GaInSb, InBiSb, InTlSb, InPSb, InAsBiSb, or InPBiSb. The active region may also be a quantum well region. Methods for fabricating the **detectors** are also described.

IT **25152-52-7**, Aluminum antimonide **106603-91-2**, Indium arsenide antimonide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(multicolor **photodetectors**)

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 26 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2000:737091 HCAPLUS
DN 133:289974
ED Entered STN: 19 Oct 2000
TI Channel design to reduce impact ionization in heterostructure field-effect transistors
IN Boos, J. Brad; Yang, Ming-jey; Bennett, Brian R.; Park, Doewon; Kruppa, Walter
PA United States Dept. of the Navy, USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 6133593	A	20001017	US 1999-358649	19990723
PRAI	US 1999-358649		19990723		

AB Heterostructure field-effect transistors (HFETs) and other electronic devices are fabricated from semiconductor layers to have reduced impact ionization. On to a 1st barrier layer there is added a unique 2nd sub-channel layer having high quality transport properties for reducing impact ionization. A 3rd barrier layer having a controlled thickness to permit electrons to tunnel through the layer to the sub-channel layer is added as a spacer for the 4th main channel layer. A 5th multilayer composite barrier layer is added which has at least a barrier layer in contact with the 4th channel layer and on top a 6th cap layer is applied. The device is completed by adding two ohmic contacts in a spaced apart relation on the 6th cap layer with a Schottky gate between them which is formed in contact with the 5th barrier layer. The 2nd sub-channel layer and the 4th main channel layers are made of materials which have the proper resp. **energy gaps** and ground state **energies** such that during use the transfer of hot electrons from the main channel into the sub-channel is made probable to reduce impact ionization in the main channel. In the preferred AlSb/InAs-based HFETs, the use of an Is InAs sub-channel layer under the main InAs channel improves the performance of the HEMTs particularly for gate lengths in the deep-submicron regime. The devices exhibit higher transconductance, lower output conductance, reduced gate leakage current, higher operating drain voltage, and improved frequency performance.

IT **25152-52-7 51680-21-8**, Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As))
(in fabrication of heterostructure field-effect transistors)

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 27 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2000:463690 HCAPLUS
DN 133:157370
ED Entered STN: 11 Jul 2000
TI Room temperature InAsSb **photovoltaic** midinfrared **detector**
AU Rakovska, A.; Berger, V.; Marcadet, X.; Vinter, B.; Glastre, G.; Oksenhendler, T.; Kaplan, D.
CS Laboratoire Central de Recherches Thomson CSF, Domaine de Corbeville, Orsay, 91404, Fr.
SO Applied Physics Letters (2000), 77(3), 397-399
CODEN: APPLAB; ISSN: 0003-6951
PB American Institute of Physics
AB An InAs0.91Sb0.09 p-i-n **photovoltaic** midinfrared **detector** grown by MBE and operating at room temp. is presented. An R0A of 1.05 Ω cm2 at 250 K and 0.12 Ω cm2 at 295 K was achieved, resulting in a **detectivity** of 4.5 × 109 cm√Hz/W at 3.39 μm and 250 K The quality of the active region material ensures a sufficiently low generation-recombination current. Room temp. performances are limited by the diffusion of holes from the active region through the confining barriers.
IT Optical **detectors**
IT **12064-03-8**, Gallium antimonide
(room temp. InAsSb **photovoltaic** mid-IR **detector**)
RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

IT **110619-84-6**, Antimony indium arsenide sb0.09inas0.91
117944-40-8, Aluminum gallium antimonide al0.5ga0.5sb
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(room temp. InAsSb **photovoltaic** mid-IR **detector**)
RN 110619-84-6 HCAPLUS
CN Antimony indium arsenide (Sb0.09InAs0.91) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.91	7440-38-2
Sb	0.09	7440-36-0

RN 117944-40-8 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.5:1:0.5)

Component	Ratio	Component Registry Number
Ga	0.5	7440-55-3
Sb	1	7440-36-0
Al	0.5	7429-90-5

L41 ANSWER 35 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1998:572332 HCAPLUS
DN 129:209164
TI Interband quantum well cascade laser, with a blocking quantum well for improved quantum efficiency
IN Meyer, Jerry; Vurgaftman, Igor; Yang, Ruan Q.
PA United States Dept. of the Navy, USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 5799026	A	19980825	US 1996-743433	19961101
PRAI	US 1996-743433		19961101		

AB Gain regions for interband quantum well lasers include an emitter region of semiconductor material having ≥1 conduction subband and ≥1 valence subband, these subbands being spaced apart by an **energy band-gap**; a collector region of semiconductor material having ≥1 conduction subband and ≥1 valence subband, these subbands spaced apart by an **energy band-gap**; a type-I or type-II active region; and a blocking quantum well region of semiconductor material between the active region and the collector region, for keeping electrons in the active region from tunnelling or scattering into the collector region, but allowing electrons in the highest valence subband in the active region to pass into the collector region. Cascade lasers formed from a stack of these gain regions, connected in series, optical cladding regions at opposing ends of the stack, and a voltage source for applying a bias voltage to the stack, and an optical cavity perpendicular to the stacking axis fabricated by cleaving or other means are also described.

IT **12064-03-8**, Gallium antimonide **25152-52-7**, Aluminum antimonide **106603-88-7**, Aluminum gallium antimonide **106603-89-8**, Antimony gallium arsenide ((Sb,As)Ga) **106603-91-2**, Indium arsenide antimonide
(interband quantum well cascade lasers with blocking quantum wells for improved quantum efficiency)

RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-89-8 HCAPLUS
CN Antimony gallium arsenide ((Sb,As)Ga) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 36 OF 66 HCAPLUS

AN 1998:559052 HCAPLUS

DN 129:142406

TI Infrared **detector** with an uncooled quantum well structure

IN Rosencher, Emmanuel; Vinter, Borge; Kaplan, Daniel; Micheron, Francois; Berger, Vincent

PA Thomson CSF S. A., Fr.

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	FR 2757684	A1	19980626	FR 1996-15738	19961220
	FR 2757684	B1	19990326		
	US 5969375	A	19991019	US 1997-991301	19971216
	CA 2222855	AA	19980620	CA 1997-2222855	19971217
	JP 10190021	A2	19980721	JP 1997-351396	19971219
PRAI	FR 1996-15738	A	19961220		

AB The invention concerns a semiconductor quantum well structure contg. a low-gap semiconductor inserted between 2 large-gap semiconductor materials. The structure has a coupling grating placed between the wave to be **detected** (the plane of incidence) and the low-gap **detection** layer; in this configuration the **detection** layer can be very thin, typically on the order of 1000 Å, and leads to **detectivity** enhancement, limited by the dark current.

IT **12064-03-8**, Gallium antimonide **25152-52-7**, Aluminum antimonide **106603-88-7**, Aluminum gallium antimonide **106603-91-2**, Indium arsenide antimonide **111706-54-8**, Antimony indium arsenide (Sb0.15InAs0.85)

(IR **detector** with uncooled semiconductor quantum well structure)

RN 12064-03-8 HCAPLUS

CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 25152-52-7 HCAPLUS

CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 106603-88-7 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS

CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

RN 111706-54-8 HCAPLUS

CN Antimony indium arsenide (Sb0.15InAs0.85) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.85	7440-38-2
Sb	0.15	7440-36-0

L41 ANSWER 39 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1998:54492 DN 128:198068

TI Direct- and indirect-**energy-gap** dependence on Al concentration in AlxGa1-xSb (x≤0.41)

AU Bignazzi, A.; Grilli, E.; Guzzi, M.; Bocchi, C.; Bosacchi, A.;

SO Physical Review B: Condensed Matter and Materials Physics (1998), 57(4), 2295-2301

AB The absorption spectra of AlxGa1-xSb alloys (x≤0.41), measured at low temps., were fitted including the contribution of direct and indirect transitions, taking into account the excitonic effects. This procedure yields accurate values of the energy of the direct Γ-Γ gap, EgΓ(x), as a function of the compn. and allows the detn. of the compn. dependence of the energy of the indirect Γ-L gap, EgL(x). The dependence of the **energies** of the 2 **gaps** on the Al mole fraction for x≤0.41 is linear instead of quadratic, as reported so far. The extrapolation of this result to the whole x range (0≤x≤1) is discussed. A value of the Γ-L crossover concn. (xc = 0.22) significantly lower than the commonly accepted 1 (xc = 0.35) was obtained.

IT **107067-95-8 109117-63-7 111567-74-9 111567-75-0 115866-66-5 120922-66-9 120922-85-2 193092-01-2**
(direct- and indirect-**energy-gap** dependence on Al concn. in aluminum gallium arsenide [AlxGa1-xSb (x≤0.41)])

RN 107067-95-8 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0.25:1:0.75) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.75	7440-55-3
Sb	1	7440-36-0
Al	0.25	7429-90-5

RN 109117-63-7 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0.11:1:0.89) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.89	7440-55-3
Sb	1	7440-36-0
Al	0.11	7429-90-5

RN 111567-74-9 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0.2:1:0.8) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.8	7440-55-3
Sb	1	7440-36-0
Al	0.2	7429-90-5

RN 111567-75-0 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0.3:1:0.7) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.7	7440-55-3
Sb	1	7440-36-0
Al	0.3	7429-90-5

RN 115866-66-5 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0.15:1:0.85) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.85	7440-55-3
Sb	1	7440-36-0
Al	0.15	7429-90-5

RN 120922-66-9 HCAPLUS

CN Aluminum, compd. with antimony and gallium (0.05:1:0.95) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.95	7440-55-3
Sb	1	7440-36-0
Al	0.05	7429-90-5

RN 120922-85-2 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.35:1:0.65) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.65	7440-55-3
Sb	1	7440-36-0
Al	0.35	7429-90-5

RN 193092-01-2 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.41:1:0.59) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.59	7440-55-3
Sb	1	7440-36-0
Al	0.41	7429-90-5

L41 ANSWER 42 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1996:543950 HCAPLUS
DN 125:183421
ED Entered STN: 12 Sep 1996
TI Semiconductor **photoelectric cathodes** and devices with the **cathodes**
IN Futahashi, Tokuaki
PA Hamamatsu Photonics Kk, Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 08153463	A2	19960611	JP 1994-293038	19941128
	JP 3537515	B2	20040614		
PRAI	JP 1994-293038		19941128		

CLASS
AB The **cathodes**, which generate electron upon light absorption, and emit the electron by accelerating through external field, contain p-type light-absorbing 1st semiconductor layers (e.g., Ge) on semiconductor substrates (e.g., GaAs), p-type 2nd semiconductor layers (e.g., GaAs), Schottky electrodes in Schottky contact with, and covering part or the whole of the 2nd semiconductor layers, and having openings, 3rd semiconductor (active) layers having smaller work function than that of the 2nd semiconductor layers, and formed in the openings, and semiconductors (e.g., ZnSe)(channel lattices) buried in the 2nd semiconductor layers and below the Schottky electrodes, and having **wider** bandgap than that of the 2nd semiconductor layers.
IT **Cathodes**
Photoelectric devices
(semiconductor **photoelec. cathodes** and devices with the **cathodes**)
IT **12064-03-8**, Gallium antimonide **106603-88-7**, Aluminum gallium antimonide **106603-91-2**, Antimony Indium arsenide
RL: DEV (Device component use); USES (Uses)
(semiconductor **photoelec. cathodes** and devices with the **cathodes**)

RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 44 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1996:543948 HCAPLUS
DN 125:183419
ED Entered STN: 12 Sep 1996
TI Semiconductor **photoelectric cathodes** and devices with the **cathodes**
IN Futahashi, Tokuaki
PA Hamamatsu Photonics Kk, Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 08153461	A2	19960611	JP 1994-292977	19941128
	JP 3433537	B2	20030804		
PRAI	JP 1994-292977		19941128		

AB The **cathodes**, which generate electron upon light absorption, and emit the electron by accelerating through external field, contain p-type light-absorbing 1st semiconductor layers (e.g., Ge) on semiconductor substrates (e.g., GaAs), p-type 2nd semiconductor layers (e.g., GaAs), Schottky electrodes in Schottky contact with, and covering part or the whole of the 2nd semiconductor layers, and having openings, 3rd semiconductor (active) layers having smaller work function than that of the 2nd semiconductor layers, and formed in the openings, p-type semiconductors (e.g., ZnSe)(channel lattices) buried in the 2nd semiconductor layers and below the Schottky electrodes, and having greater impurity concn. than that of the 2nd semiconductor layers, and elec. conductors to apply voltage on the semiconductor parts.

ST semiconductor **photoelec cathode** device Schottky electrode; gallium arsenide germanium **photoelec cathode** device; zinc selenide **photoelec cathode** device; elec conductor **photoelec cathode** device

IT **Cathodes**
Photoelectric devices
(semiconductor **photoelec. cathodes** and devices with the **cathodes**)

IT **12064-03-8**, Gallium antimonide **106603-88-7**, Aluminum gallium antimonide **106603-91-2**, Antimony indium arsenide
(semiconductor **photoelec. cathodes** and devices with the **cathodes**)

RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 58 OF 66 HCAPLUS

AN 1991:420465 HCAPLUS
DN 115:20465
ED Entered STN: 12 Jul 1991
TI Semiconductor light-receiving device
IN Ito, Kazuhiro
PA Hitachi, Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 02303073	A2	19901217	JP 1989-121519	19890517
PRAI	JP 1989-121519		19890517		

AB A 1st semiconductor light-receiving device comprises at least a 1st layer, on a light-incident side with respect to an AlGaSb-based amplifier layer, having a narrower band gap than the amplifier layer and a 2nd layer having a band gap in the order **wider** than the amplifier layer. A communication system device may comprises the 1st semiconductor light-receiving device. A 2nd semiconductor light-receiving device comprising a light-absorbing layer which generates an electron and hole by the light signal and a depletion layer, has a structure not to absorb the light in the outside of the depletion layer. The 2nd semiconductor light-receiving device may comprise a window layer on the light-incident side. The semiconductor light-receiving device gives a fast response time to a **wide** range of the signal wavelength, and has a low noise.

IT **Photoelectric** devices
(semiconductor, light receiver, depletion films for)
IT **108915-80-6**, Antimony indium arsenide (Sb0.1InAs0.9)
134352-06-0, Aluminum antimony gallium (Al0.03SbGa0.97)
RL: USES (Uses)
(film, for semiconductor light-receiving device)
RN 108915-80-6 HCAPLUS
CN Antimony indium arsenide (Sb0.1InAs0.9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.9	7440-38-2
Sb	0.1	7440-36-0

RN 134352-06-0 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.03:1:0.97) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.97	7440-55-3
Sb	1	7440-36-0
Al	0.03	7429-90-5

IT **12064-03-8**, Gallium antimonide
(semiconductor light-receiving devices on)
RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

L41 ANSWER 66 OF 66 HCAPLUS

AN 1987:165855 HCAPLUS
DN 106:165855
ED Entered STN: 15 May 1987
TI Light-emitting semiconductor device
IN Hayashi, Hideki
PA Sumitomo Electric Industries, Ltd., Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 201930	A2	19861120	EP 1986-106671	19860515
	EP 201930	A3	19880120		
	JP 62054489	A2	19870310	JP 1986-110175	19860514
	CA 1275485	A1	19901023	CA 1986-509128	19860514
	US 4815087	A	19890321	US 1986-863609	19860515
PRAI	JP 1985-104188	A	19850515		

AB A high-efficiency light-emitting double-heterojunction semiconductor device is described which is stably operable at high speed and with low threshold current. The device comprises: a 1st layer of 1st cond. type; a 2nd layer of 2nd cond. type; an active layer of laminated semiconductor layers of the quantum well structure interposed between the above 2 semiconductor layers and having a narrower effective **energy band gap** than those of the 1st and 2nd layers; and a diffraction grating formed either in the 1st or the 2nd layer.

IT **12064-03-8**, Gallium antimonide
RL: PRP (Properties)
(light-emitting semiconductor device with **substrate** and active layer from)

IT **106603-88-7**
RL: PRP (Properties)
(light-emitting semiconductor device with active **layer** from)

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

IT **12064-03-8**, Gallium antimonide
RL: PRP (Properties)
(light-emitting semiconductor device with **substrate** and active layer from)

RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

L45 ANSWER 1 OF 3 HCAPLUS

AN 1977:181642 HCAPLUS
DN 86:181642
ED Entered STN: 12 May 1984
TI Semiconductor photoelectron emission device
IN Hara, Katsuo; Hagino, Minoru; Sukegawa, Tokuzo
PA Hamamatsu Terebi K. K., Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 4015284	A	19770329	US 1976-647761	19760109 <--
	US 3953880	A	19760427	US 1974-455231	19740327 <--
PRAI	US 1974-455231	A3	19740327		
	JP 1973-72294	A	19730628		

CLASS

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES	
US 4015284	IC	H01L029-161	
	INCL	357016000	
US 4015284	NCL	257/010.000; 257/201.000; 313/542.000	<--
US 3953880	NCL	257/010.000; 257/201.000; 257/441.000; 313/542.000	<--

AB A photoelectron emission device consists of a heterojunction of mixed crystals of $\geq$2 semiconductors. The crystals define a 1st region of direct transition type semiconductor and a 2nd region of an indirect transition type semiconductor having a forbidden band **wider** than that of the 1st region. This combination enables a high probability of electron transitions and increase of photoelectrons generated per unit of incident light. Also, only a small amt. of electrons are lost by recombination. In particular, p-GaSb which is a direct transition type semiconductor, a layer of intrinsic $Ga_{1-x}Al_xSb$ ($x < 1$), a p-type layer of $Ga_{1-y}Al_ySb$ ($0.4 < y < x$), an alkali metal or alkali metal-O activation layer on the opposite side of the $Ga_{1-y}Al_ySb$ layer, and means for applying a bias voltage to the junctions comprise a photoelectron emission device. The $Ga_{1-y}Al_ySb$ layer has a thickness equiv. of less than the electron diffusion length. The effective forbidden band of GaSb is 0.7-1.25 eV, and of $Ga_{1-y}Al_ySb$, it is 1.25-1.6 eV.

ST **photocathode** semiconductor; cathode photo semiconductor; gallium aluminum antimonide **photocathode**

IT Cathodes
(photo-, from gallium antimonide and gallium aluminum antimonide)

IT 12064-03-8
RL: USES (Uses)
(**photocathodes** from gallium aluminum antimonide and)

IT 12064-03-8D, solid solns. with aluminum antimonide 25152-52-7D, solid solns. with gallium antimonide
RL: USES (Uses)
(**photocathodes** from gallium antimonide and)

L45 ANSWER 2 OF 3 HCAPLUS

AN 1975:556845 HCAPLUS
DN 83:156845
ED Entered STN: 12 May 1984
TI Group III-V compound photoemitters having a high quantum efficiency and long wavelength response
IN Schaefer, Donald L.
PA General Electric Co., USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE	
PI	US 3900865	A	19750819	US 1971-206947	19711210	<--
	US 3672992	A	19720627	US 1969-846155	19690730	<--
PRAI	US 1969-846155	A3	19690730			

AB A photoemitter with improved ir response consists of a semiconductive layer of a Group III-V compd. which has a bandgap equal to a desired photoelec. threshold, a 10-100 Å thick film of a 2nd III-V compd. which has a **wider** bandgap and contg. absorbed electropos. ions in an amt. sufficient to lower the surface work function to the desired photoelec. threshold. The structure has relatively high quantum efficiency. For example, a GaSb epitaxial layer is grown on a substrate, e.g. of optical quality borosilicate glass or GaAs. The layer is doped highly p-type, and a GaP layer is then deposited. This layer may be treated with both Cs and O to reduce the surface work function below a level achievable by Cs irradn. alone. The C bombardment and oxidn. step may occur simultaneously or sequentially. Structures involving other III-V compd. semiconductors are described, and the possible use of cesiation without oxidn. is included.

ST **photocathode** IIIA pnictide treatment; gallium pnictide **photocathode** surface; phosphide gallium **photocathode** surface; antimonide gallium **photocathode** surface; cesiation oxidn semiconductor **photocathode**; cathode photo semiconductor pnictide

IT Group IIIA element pnictides
RL: USES (Uses)
(for cathode structure contg. layers of, treated with cesium)

IT Cathodes
(photo-, from Group III-V compd. layers treated with cesium)

IT 12063-98-8, uses and miscellaneous
RL: USES (Uses)
(**photocathode** structure contg. layers of, treated with cesium)

IT 12064-03-8
RL: USES (Uses)
(**photocathode** structures contg. layers of)

IT 7440-46-2, uses and miscellaneous 7782-44-7, uses and miscellaneous
RL: USES (Uses)
(**photocathode** structures from III-V compd. layers treated with)

L41 ANSWER 11 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2003:697196 HCAPLUS
DN 139:216929
ED Entered STN: 05 Sep 2003
TI Monolithic **photovoltaic** energy conversion device
IN Wanlass, Mark W.; Mascarenhas, Angelo
PA Midwest Research Institute, USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2003073517	A1	20030904	WO 2002-US5781	20020227
	WO 2003073518	A1	20030904	WO 2002-US5871	20020228
	US 2003160251	A1	20030828	US 2003-275123	20030310
PRAI	WO 2002-US5781	A	20020227		
	WO 2002-US5871	W	20020228		

AB A multi-junction, monolithic, **photovoltaic** cell and device is provided for converting radiant energy to **photocurrent** and **photovoltage** with improved efficiency. The PV cell includes an array of subcells, i.e., active p/n junctions, grown on a compliant substrate, where the compliant substrate accommodates greater flexibility in matching lattice consts. to adjacent semiconductor material. The lattice matched semiconductor materials are selected with appropriate band-gaps to efficiently create **photovoltage** from a larger portion of the solar spectrum. Subcell strings from multiple PV cells are voltage matched to provide high output PV devices. A light emitting cell and device is also provided having monolithically grown red-yellow and green emission subcells and a mech. stacked blue emission subcell.

IT **Photoelectric** devices
IT **51680-21-8**, Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As))
(monolithic **photovoltaic energy** conversion device)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 15 OF 66 HCAPLUS

AN 2003:300300 HCAPLUS
DN 138:306822
ED Entered STN: 18 Apr 2003
TI **Wide**-bandgap, lattice-mismatched window layer for a solar energy conversion device
IN King, Richard Roland; Colter, Peter C.; Ermer, James H.; Haddad, Moran; Karam, Nasser H.

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2003070707	A1	20030417	US 2001-976508	20011012
	US 2003145884	A1	20030807	US 2003-356028	20030131
PRAI	US 2001-976508	A2	20011012		

AB The invention is about **photovoltaic** cell or other optoelectronic device having a **wide**-bandgap semiconductor used in the window layer. This **wider** bandgap is achieved by using a semiconductor compn. that is not lattice-matched to the cell layer directly beneath it and/or to the growth substrate. The **wider** bandgap of the window layer increases the transmission of short wavelength light into the emitter and base layers of the **photovoltaic** cell. This in turn increases the current generation in the **photovoltaic** cell. Addnl., the **wider** bandgap of the lattice mismatched window layer inhibits minority carrier injection and recombination in the window layer.

IT **51680-21-8**, Aluminum antimony gallium arsenide
RL: DEV (Device component use); USES (Uses)
(**wide-bandgap**, lattice-mismatched window layer for solar **energy** conversion device)

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 17 OF 66 HCAPLUS

AN 2002:946741 HCAPLUS
DN 138:18611
ED Entered STN: 13 Dec 2002
TI Ultra-linear multi-channel field effect transistor
IN Fahimulla, Ayub M.; Hier, Harry Stephen; Aina, Olaleye A.
PA USA
SO U.S. Pat. Appl. Publ., 18 pp., Cont.-in-part of U.S. Ser. No. 618,884.
CODEN: USXXCO
DT Patent
LA English

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2002185655	A1	20021212	US 2002-176787	20020624
PRAI	US 2000-618884	A2	20000718		

AB Alternate layers of **wide** band gap and narrow band gaps of different kinds of semiconductors were used to form multiple channels of a FET. The channels are doped or formed as 2-DEG/2-DHG in narrow band semiconductor by charge supply layer in the **wide** band gap semiconductor. The different kinds of semiconductors form heterojunctions to confine the electrons/holes in sep. thin spikes layers. A no. of spikes (3-10 nm thick) of different doped or 2-DEG/2-DHG concns. in various channels can result in overall electron concn. gradient such as a 1/x3electron/hole concns. profile. Such an electron/hole concn. gradient can result in a linear variation of drain current with voltage to obtain a **wide** dynamic range.

IT **51680-21-8**, Aluminum antimony gallium arsenide
RL: DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(aluminum gallium indium arsenide phosphide **wide bandgap** ultra-linear multi-channel field effect transistor)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 18 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2002:117683 HCAPLUS
DN 137:68432
ED Entered STN: 14 Feb 2002
TI Theoretical analysis of disorder effects on electronic and optical properties of the quaternary alloy Ga1-xAlxAsySb1-y
AU Rabah, M.; Abid, H.; Bouhafs, B.; Aourag, H.
CS Applied Materials Laboratory, University of Sidi Bel-Abbes, Sidi Bel-Abbes, 22000, Algeria
SO Materials Chemistry and Physics (2002), 74(3), 328-335
CODEN: MCHPDR; ISSN: 0254-0584
PB Elsevier Science B.V.
AB The effects of structural and chem. disorder on electronic and optical properties of GaAlAsSb quaternary alloy are studied on the basis of a modified virtual crystal approxn. calcd. within a simple tight-binding sp3s* theory, which incorporates compositional disorder as an effective potential. Using a minimal set of fitting parameters, we show that such an approach provides anal. results for calcg. **energy gaps** and bowing parameters. We show that the calcd. bowing parameter agrees reasonably well with exptl. data and other recent calcns. The essential features of structure and disorder-induced changes in electronic and optical structure are exhibited in the sp3s* results by two characterization parameters: the subband energy spacing and the d. of states. The changes in each of them are found to depend on the interrelated trends of structure and disorder effects.
IT **25152-52-7 51680-21-8**, Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As))
(theor. anal. of disorder effects on electronic and optical properties of quaternary alloy Ga1-xAlxAsySb1-y)
RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 19 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:793870 HCAPLUS
DN 135:366150
ED Entered STN: 01 Nov 2001
TI Method for dyeing or labeling analytical samples with quantum dots or dendrimers containing fluorescent groups
IN Iketaki, Yoshinori; Fujii, Masaaki; Omatsu, Takashige; Suzuki, Tomoo; Minakata, Makoto; Yamamoto, Kimitoshi; Nakaya, Kazuhiko
PA Olympus Optical Co., Ltd., Japan; Nippon Roper K. K.; Foundation for Scientific Technology Promotion

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2001305030	A2	20011031	JP 2000-118633	20000419
PRAI	JP 2000-118633		20000419		

AB The method gives samples which can be **detected** by double-resonance absorption microscope at an ultrahigh resoln.
IT **25152-52-7 51680-21-8**, Aluminum antimony gallium arsenide
RL: ARG (Analytical reagent use); ANST (Analytical study); USES (Uses) (labeling agent; method for dyeing or labeling anal. samples with quantum dots or dendrimers contg. fluorescent groups)
RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 21 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:687711 HCAPLUS
DN 135:378399
ED Entered STN: 20 Sep 2001
TI Optoelectronic properties of **photodiodes** for the mid-and far-infrared based on the InAs/GaSb/AlSb materials family
AU Fuchs, Frank; Buerkle, L.; Hamid, R.; Herres, N.; Pletschen, Wilfried; Sah, R. E.; Kiefer, Rudolf; Schmitz, J.
CS Fraunhofer-Institut fuer Angewandte Festkoerperphysik (IAF), Freiburg, D-79108, Germany
SO Proceedings of SPIE-The International Society for Optical Engineering (2001), 4288(Photodetectors: Materials and Devices VI), 171-182
CODEN: PSISDG; ISSN: 0277-786X
PB SPIE-The International Society for Optical Engineering
DT Journal
LA English
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
AB The optoelectronic properties of short-period InAs/(GaIn)Sb superlattices (SLs) grown by MBE on GaSb substrates are discussed. The authors report on the optimization of the SL materials properties with special emphasis on the use for IR **detection** devices. The materials quality is evaluated by using high resoln. x-ray diffraction, at. force microscopy, and photoluminescence spectroscopy. In- plane magneto-transport studies were performed applying mobility spectrum anal. The SL diodes were analyzed performing std. electrooptical measurements. The observation of resonances in the I-V curves in the regime of Zener-tunneling due to Wannier-Stark localization opens a new tool for the elec. study of **photodiodes** with low **band gap energy**. The status of the processing technol. is reported demonstrating the feasibility for the fabrication of 256 X 256 focal plane arrays operating in the 8-to-12 μm atm. window. In addn., results are given for mid-IR SL-diodes, grown with lattice matched AlGaAsSb barriers instead in the binary InAs/GaSb SL system.
IT Optical **detectors**
(focal plane array; optoelectronic properties of **photodiodes** for mid-and far-IR based on InAs/GaSb/AlSb materials family)
IT Atomic force microscopy
Band gap
IT **25152-52-7**, Aluminum antimonide **51680-21-8**, Aluminum gallium arsenide antimonide
RL: DEV (Device component use); USES (Uses)
(optoelectronic properties of **photodiodes** for mid-and far-IR based on InAs/GaSb/AlSb materials family)
RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 **ANSWER** 23 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2001:381860 HCAPLUS
DN 135:124861
ED Entered STN: 28 May 2001
TI Advances in low-bandgap InAsSbP/InAs and GaInAsSb/GaSb thermophotovoltaics
AU Mauk, Michael G.; Shellenbarger, Zane A.; Cox, Jeffrey A.; Tata, Anthony N.; Warden, Tammie G.; Dinetta, Louis C.; Mueller, Robert L.
CS AstroPower, Inc., Newark, DE, 19716-2000, USA
SO Conference Record of the IEEE Photovoltaic Specialists Conference (2000), 28th, 1028-1031
CODEN: CRCNDP; ISSN: 0160-8371
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
AB Thermophotovoltaic devices based on InGaAsSb and InAsSbP alloys made by liq.-phase epitaxy are described. These alloys can be readily grown as thick (>50 μm) layers to form "virtual" substrates. We are developing cell fabrication technologies to realize series-interconnected InGaAsSb and InAsSbP thermophotovoltaic cell arrays for high-voltage minimodules by transferring epitaxial device structures to insulating surrogate substrates.
IT **51680-21-8**, Aluminum gallium antimonide arsenide
RL: DEV (Device component use); USES (Uses)
(advances in low-**bandgap** InAsSbP/InAs and GaInAsSb/GaSb thermophotovoltaics)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 **ANSWER** 29 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 2000:270095 HCAPLUS
DN 132:301803
ED Entered STN: 26 Apr 2000
TI Liquid-phase epitaxy of low-bandgap III-V antimonides for thermophotovoltaic devices
AU Mauk, M. G.; Shellenbarger, Z. A.; Cox, J. A.; Sulima, O. V.; Bett, A. W.; Mueller, R. L.; Sims, P. E.; McNeely, J. B.; DiNetta, L. C.
CS AstroPower, Inc., Newark, DE, 19716-2000, USA
SO Journal of Crystal Growth (2000), 211(1-4), 189-193
CODEN: JCRGAE; ISSN: 0022-0248
PB Elsevier Science B.V.
DT Journal
LA English
CC 76-5 (Electric Phenomena)
Section cross-reference(s): 73, 75
AB Liq.-phase epitaxial growth of low-bandgap III-V antimonides is developed for thermophotovoltaic and other optoelectronic device applications. Epitaxial layers of (Al,Ga)(As,Sb), (In,Ga)(As,Sb), and In(As,Sb,P) with thicknesses up to 200 μm can be grown in a single LPE step. TPV devices based on In(As,Sb,P) extend the spectral response to a wavelength of 3500 nm. These single-epilayer structures are compatible with post-growth zinc diffusion processes that produce high-performance TPV devices. Thick epitaxial layers are also conducive for epilayer film transfer to surrogate substrates and subsequent removal of the GaSb and InAs seeding substrate. An insulating surrogate substrate facilitates isolation schemes for monolithic series-interconnected TPV arrays, and a reflective substrate acting as a backside mirror is used to effect **photon** recycling.
IT **155702-91-3**
RL: DEV (Device component use); FMU (Formation, unclassified); FORM (Formation, nonpreparative); USES (Uses)
(liq.-phase epitaxy of low-**bandgap** III-V antimonides for thermophotovoltaic devices)
RN 155702-91-3 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.67:1:0.33) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.33	7440-55-3
Sb	1	7440-36-0
Al	0.67	7429-90-5

L41 ANSWER 30 OF 66 HCAPLUS

AN 1999:727451 HCAPLUS
DN 131:315625
ED Entered STN: 17 Nov 1999
TI Indium-based alloy and infrared transducer using this alloy
IN Verie, Christian; Lorans, Dominique; Poirier, Michel
PA Sagem S. A., Fr.

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	FR 2775388	A1	19990827	FR 1998-2344	19980226
	FR 2775388	B1	20011207		
	EP 939447	A1	19990901	EP 1999-400446	19990224
	US 6274882	B1	20010814	US 1999-258203	19990226
PRAI	FR 1998-2344	A	19980226		

AB The authors present an alloy designed for an IR transducer; it consists of (In1-x)(As1-ySby) where 0≤x<1 and where x and y are each less than 1/2. The transducer contains, on a substrate of GaSb or AlSb, an active layer of an alloy of compn. such that it is lattice matched to the substrate material.
ST **detector** IR indium antimony thallium arsenide; transducer IR indium antimony thallium arsenide
IT Optical **detectors**
Transducers
(IR; indium-based alloy with antimony, arsenic and thallium and use of alloy in IR transducer)
IT Passivation
IT **106603-91-2**, Antimony indium arsenide ((Sb,As)In)
RL: DEV (Device component use); USES (Uses)
(active layer; indium-based alloy with antimony, arsenic and thallium and use of alloy in IR transducer)
RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

IT **25152-52-7**, Aluminum antimonide
RL: DEV (Device component use); USES (Uses)
(substrate; indium-based alloy with antimony, arsenic and thallium and use of alloy in IR transducer)
RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

L41 **ANSWER** 31 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1999:299862 HCAPLUS
DN 131:94422
ED Entered STN: 17 May 1999
TI Arsenic incorporation in molecular beam epitaxy (MBE) grown (AlGaIn)(AsSb) layers for 2.0-2.5 µm laser structures on GaSb substrates
AU Simanowski, S.; Walther, M.; Schmitz, J.; Kiefer, R.; Herres, N.; Fuchs, F.; Maier, M.; Mermelstein, C.; Wagner, J.; Weimann, G.
CS Fraunhofer-Institut fur Angewandte Festkorperphysik, Freiburg, D-79108, Germany
SO Journal of Crystal Growth (1999), 201/202, 849-853
CODEN: JCRGAE; ISSN: 0022-0248
PB Elsevier Science B.V.
DT Journal
LA English
CC 73-10 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
AB The incorporation of As and In during MBE growth in (AlGaIn)/(AsSb) layers used for the fabrication of diode lasers in the 2.0-2.5 µm wavelength range was studied. The As content depends linearly on the beam equiv. pressure for As mole fractions between y = 0.05 and y = 0.20. Broad area AlGaAsSb/GaInAsSb single-quantum well laser diodes with quasi-cw output at room temp. at an emission wavelength of 2.03 µm and a threshold c.d. of 515 A/cm2 for 1370 µm long and 70 µm **wide** devices were fabricated. To shift the emission wavelength of the laser structures to longer wavelengths, the growth of lattice matched AlGaAsSb/GaInAsSb laser core structures with different In and As mole fractions in the quantum wells was studied.
IT **12064-03-8**, Gallium antimonide (GaSb) **51680-21-8**, Aluminum gallium arsenide antimonide
RL: DEV (Device component use); USES (Uses)
(arsenic incorporation in mol. beam epitaxy (MBE) grown (AlGaIn)(AsSb) **layers** for 2.0-2.5 µm laser structures on GaSb **substrates**)
RN 12064-03-8 HCAPLUS
CN Antimony, compd. with gallium (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
Sb	1	7440-36-0

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 **ANSWER** 32 OF 66 HCAPLUS

AN 1999:174832 HCAPLUS
DN 130:273741
ED Entered STN: 17 Mar 1999
TI 2 µm wave band InGaAsSb/AlGaAsSb **wide** stripe MQW diode laser
AU Chen, Gaoting; Bai, Jingsong; Zhang, Yunmei; Geng, Jianxin; Fang, Zujie; Li, Aizhen; Zheng, Yanlan; Lin, Chun
CS Shanghai Institute of Optics and Fine Mechanics, The Chinese Academy of Sciences, Shanghai, 201800, Peop. Rep. China
SO Zhongguo Jiguang (1998), A25(12), 1069-1072
CODEN: ZHJIDO; ISSN: 0258-7025
PB Kexue Chubanshe
DT Journal
LA Chinese
CC 73-10 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
IT **51680-21-8P**, Aluminum antimony gallium arsenide
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(2 µm wave band InGaAsSb/AlGaAsSb **wide** stripe MQW diode laser)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 **ANSWER** 33 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1999:166995 HCAPLUS
DN 130:360672
ED Entered STN: 15 Mar 1999
TI InAsSb light-emitting diodes for the **detection** of CO2 (λ=4.3 μm)
AU Popov, A. A.; Stepanov, M. V.; Sherstnev, V. V.; Yakovlev, Yu. P.
CS A. F. Ioffe Physicotechnical Institute, Russian Academy of Sciences, St. Petersburg, Russia
SO Technical Physics Letters (Translation of Pis'ma v Zhurnal Tekhnicheskoi Fiziki) (1998), 24(8), 596-598
CODEN: TPLEED; ISSN: 1063-7850
PB American Institute of Physics
DT Journal
LA English
CC 79-6 (Inorganic Analytical Chemistry)
Section cross-reference(s): 73, 76
AB The main characteristics of room-temp. light-emitting diodes (λ=4.3 μm) based on InAsSbP/InAsSb/InAsSbP III-V semiconductor heterostructures with a variable-gap buffer layer are reported. An optical power P = 0.85 mW was achieved with a pulse length of ~5 μs and 1 kHz repetition frequency. Conditions for maximizing the power of the light-emitting diodes are indicated. An example is given of the use of these diodes to **detect** carbon dioxide using the 4.3 μm fundamental absorption band.
IT **106603-91-2**, Antimony indium arsenide ((Sb,As)In)
RL: ARU (Analytical role, unclassified); DEV (Device component use); PRP (Properties); ANST (Analytical study); USES (Uses)
(carbon dioxide **detection** by **absorption** spectroscopy with light-emitting diodes based on InAsSbP/InAsSb/InAsSbP III-V semiconductor heterostructures with variable-gap buffer layer)
RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 **ANSWER** 34 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1998:750805 HCAPLUS
DN 130:59579
ED Entered STN: 27 Nov 1998
TI **Energy bandgap** of AlxGa1-xAs1-ySby and conduction band discontinuity of AlxGa1-xAs1-ySby/InAs and AlxGa1-xAs1-ySby/InGaAs heterostructures
AU Anwar, A. F. M.; Webster, R. T.
CS Electrical and Systems Engineering Dept., University of Connecticut, Storrs, CT, 06269-3157, USA
SO Solid-State Electronics (1998), 42(11), 2101-2104
CODEN: SSELA5; ISSN: 0038-1101
PB Elsevier Science Ltd.
DT Journal
LA English
CC 76-3 (Electric Phenomena)
AB A technique to det. the conduction band discontinuity in any heterostructure and the resulting band alignment is presented. **Energy bandgaps** of the quaternary AlGaAsSb and conduction band discontinuity for lattice matched AlxGa1-xAs1-y/InAs, AlxGa1-xAs1-ySby/In0.8Ga0.2As and AlxGa1-xAs1-ySby/In0.52Ga0.48As heterostructures are reported for varying Al and Sb mole fractions to demonstrate the method. AlxGa1-xAs1-ySby/InAs changes from a type-II broken-gap alignment to type-II staggered alignment near an Al mole fraction of 0.15 followed by a change from type-II to type-I near an Al mole fraction of 0.9 No type-II broken-band alignments are obsd. in the other two lattice matched systems. The min. Al mole fraction required for type-I band alignment increases with increasing In mole fraction. It is shown that the quaternary bandgap becomes indirect for Al mole fractions greater than approx. 0.4 and the conduction band discontinuity is a linear function of the Al mole fraction for the lattice-matched systems.
IT 107827-20-3, Gallium indium arsenide (Ga0.2In0.8As)
PROC (Process)
(lattice matching to aluminum antimony gallium arsenide; **energy bandgap** of AlxGa1-xAs1-ySby and conduction band discontinuity of heterostructures)
IT **51680-21-8**, Aluminum antimony gallium arsenide (Al0-1Sb0-1Ga0-1As0-1)
(**energy bandgap; energy bandgap** of AlxGa1-xAs1-ySby and conduction band discontinuity of AlxGa1-xAs1-ySby/InAs and AlxGa1-xAs1-ySby/InGaAs heterostructures)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 37 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1998:327140 HCAPLUS
DN 129:47144
ED Entered STN: 03 Jun 1998
TI Effects of internal loss on power efficiency of mid-infrared InAs-GaInSb-AlSb quantum-well lasers and comparison with InAsSb lasers
AU Le, H. Q.; Lin, C. H.; Murray, S. J.; Yang, R. Q.; Pei, S. S.
CS MIT Lincoln Laboratory, Lexington, MA, 02173-9108, USA
SO IEEE Journal of Quantum Electronics (1998), 34(6), 1016-1030
CODEN: IEJQA7; ISSN: 0018-9197
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
CC 73-10 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76

AB Exptl. studies of the lasing efficiency of optically pumped 4-μm GaInSb-InAs-AlSb multiple-quantum-well (MQW) lasers that emitted >I-W peak power/facet at 80 K indicated that internal loss is the main factor that limits the power output. The internal loss coeff. and internal quantum efficiency were detd. by measuring the lasing efficiency vs. temp. for devices of different facet reflectivities and lengths. The internal loss coeff. increases from ~18 cm-1 near 70 K to ~60-100 cm-1 near 180 K, while the internal quantum efficiency remained const. at ~47% (or ~67% with the correction for the finite absorption of the active region) from 70 to 130 K. The increase of internal loss and the decrease of external quantum efficiency vs. temp. were found very similar to those of double-heterostructure InAsSb-GaSb lasers and were similarly interpreted in terms of intervalence band carrier absorption. Extrapolation of power performance for improved devices with lower internal loss indicated that high-efficiency multi-watt quasi-CW output with a broad-area brightness of ~1 MW/cm2•sterad is possible.

IT **110619-84-6**, Antimony indium arsenide Sb0.09InAs0.91
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(valence band structure and mid-IR intervalence band **absorption** using k.p calcn.)
RN 110619-84-6 HCAPLUS
CN Antimony indium arsenide (Sb0.09InAs0.91) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.91	7440-38-2
Sb	0.09	7440-36-0

L41 ANSWER 40 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1997:783757 HCAPLUS
DN 128:56413
ED Entered STN: 15 Dec 1997
TI Semiconductor **photocathode** and **photoemission** device using it
IN Nihashi, Tokuaki; Niigaki, Minoru
PA Hamamatsu Photonics K.K., Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 810621	A1	19971203	EP 1997-303615	19970528
	EP 810621	B1	20030709		
	R: DE, FR, GB				
	JP 09320457	A2	19971212	JP 1996-133789	19960528
	JP 3565529	B2	20040915		
PRAI	JP 1996-133789	A	19960528		

CLASS

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
EP 810621	ICM	H01J001-34
EP 810621	ECLA	H01J001/34

AB Formed on a semiconductor substrate is a 1st semiconductor layer (light-absorbing layer) of p-type which has a 1st dopant concn. and generates an electron in response to incident light. Formed on the 1st semiconductor layer is a 2nd semiconductor layer (electron-transfer layer) of p-type having a 2nd dopant concn. lower than the 1st dopant concn. A contact layer forms a p-n junction with the 2nd semiconductor layer. A surface electrode is formed on and in ohmic contact with the contact layer. A 3rd semiconductor layer (activation layer) is formed within an opening in the contact layer on the surface of the 2nd semiconductor layer. Embedded in the 2nd semiconductor layer is a semiconductor section (channel grid) having a 3rd dopant concn. Thus, the quantum efficiency is improved, while structural pixel sepn. becomes unnecessary at an open area ratio of 100%, and signal modulation is enabled.

IT **Photocathodes**
(semiconductor **photocathode** and **photoemission** device using it)

IT **25152-52-7 106603-91-2**, Antimony indium arsenide
RL: DEV (Device component use); USES (Uses)
(semiconductor **photocathode** contg.)

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

L41 ANSWER 41 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1997:267780 HCAPLUS
DN 127:11712
ED Entered STN: 26 Apr 1997
TI "Universal" dependence of avalanche breakdown on band-structure: choosing materials for high-power devices
AU Allam, Jeremy
CS Hitachi Cambridge Lab., Hitachi Europe Limited, Japan
SO Japanese Journal of Applied Physics, Part 1: Regular Papers, Short Notes & Review Papers (1997), 36(3B), 1529-1542
CODEN: JAPNDE; ISSN: 0021-4922
PB Japanese Journal of Applied Physics
DT Journal
LA English
CC 76-3 (Electric Phenomena)
AB A new simple phenomenol. relation between the breakdown voltage Vb and the band-structure in semiconductor junctions is presented. For narrow-gap semiconductors, Vb scales with the min. **energy gap** (Eg) as has been previously reported. However, for **wide**-gap materials including GaAs, InP, etc., Vb is linearly dependent on {E}, a Brillouin-zone-averaged **energy gap**. Values of {E} are detd. from accurate quasi-particle band-structures for 25 tetrahedral semiconductors. The authors discuss the origin of this relation and the role of the ionization probability and electron-phonon scattering rate. The relation can be used to predict the breakdown voltage in semiconductors and semiconductor alloys.
IT **107067-94-7 110756-48-4**, Aluminum gallium antimonide (Al0.28Ga0.72Sb)
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(phenomenol. relation between breakdown voltage and **energy gap** in semiconductors)
RN 107067-94-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.06:1:0.94) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.94	7440-55-3
Sb	1	7440-36-0
Al	0.06	7429-90-5

RN 110756-48-4 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.28:1:0.72) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.72	7440-55-3
Sb	1	7440-36-0
Al	0.28	7429-90-5

L41 ANSWER 46 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1995:170460 HCAPLUS
DN 122:39160
ED Entered STN: 08 Nov 1994
TI Evaluation of various approximations used in the envelope-function method
AU Meney, A. T.; Gonul, Besire; O'Reilly, E. P.
CS Dept. of Physics, Univ. of Surrey, Surrey, GU2 5XH, UK
SO Physical Review B: Condensed Matter and Materials Physics (1994), 50(15), 10893-904
CODEN: PRBMDO; ISSN: 0163-1829
DT Journal
LA English
CC 65-3 (General Physical Chemistry)
AB We investigate a no. of issues related to application of the envelope-function method in calcg. confined-state energies and subband structures in quantum-well structures. We first consider zone-center confined-state energies, and show how explicit elimination of spurious solns. from the envelope-function band structure leads to a slightly modified form of the std. result through which the conduction-**band** confined-state **energies** are calcd. by using a one-**band** model and an **energy**-dependent effective mass. We show that the effects of nonparabolicity can be predicted directly from the bulk band structure in an infinitely deep quantum well, and demonstrates how the bulk band structure can also be used to predict the errors in calcd. confinement energies in wells having finite depth. The correct choice of boundary conditions still remains controversial for calcn. of valence-subband structures by using the Luttinger-Kohn Hamiltonian. We compare the valence-band structure calcd. with the lowest conduction band included either explicitly or treated as a remote band, by using perturbation theory. We demonstrate that the boundary conditions derived by M. G. Burt (1992, 1994) and B. A. Foreman (1993-4) are correct. Finally, we compare the valence-band structure calcd. by using the 4 .times. 4 and 6 .times. 6 Luttinger-Kohn Hamiltonians. We show how the warping of the highest valence band is markedly different at both intermediate and large wave vectors when the spin-split-off band is included. Use of the axial model to calc. valence-band densities of states is therefore questionable with the 6 .times. 6 Hamiltonian. The calcd. warping is very sensitive to the values of the Luttinger .gamma. parameters used, indicating the importance of investing more effort to detn. these parameters accurately.
IT **Energy** level, **band** structure
(confined-state **energies** and subband structures in quantum-well structures calcd. by using various approxns. in the envelope-function method)
IT **109224-96-6**, Aluminum gallium antimonide (Al0.4Ga0.6Sb)
(confined-state **energy** and subband structure in gallium indium antimonide arsenide-aluminum gallium antimonide quantum-well structure calcd. by using various approxns. in the envelope-function method)
RN 109224-96-6 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.4:1:0.6) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.6	7440-55-3
Sb	1	7440-36-0
Al	0.4	7429-90-5

L41 ANSWER 48 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1994:259113 HCAPLUS
DN 120:259113
ED Entered STN: 14 May 1994
TI N-type antimony-based strained layer superlattice semiconductor devices and fabrication method
IN Hasenberg, Thomas C.; Brown, April S.; Larson, Lawrence E.
PA Hughes Aircraft Co., USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 565054	A2	19931013	EP 1993-105687	19930406
	EP 565054	A3	19940727		
	JP 06061270	A2	19940304	JP 1993-83667	19930409
	US 5420442	A	19950530	US 1994-223373	19940405
	US 5489549	A	19960206	US 1994-223496	19940414
PRAI	US 1992-866372	A	19920409		

AB High-speed Group III-Sb materials are n-doped in a mol. beam epitaxy process by forming a superlattice with n-doped strained layers of a Group III-V compd. upon Group III-Sb base layers. The base layers have lower conduction **band energy** levels than the strained layers, and allow doping electrons from the strained layers to flow into the base layers. The base layers preferably comprise AlxGa1-xSb, while the strained layers preferably comprise a binary or ternary compd. such as AlyGa1-yAs having a single Group V component, where x and y are each from 0 to 1.0. The strained layers can be n-doped with silicon or tin, which would produce p-type doping if added directly to the base layers.

IT **106603-88-7**, Aluminum gallium antimonide Al0-1Ga0-1Sb
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**base layer**, doping of, in fabrication of strained **layer** superlattice semiconductor devices)

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

L41 **ANSWER** 49 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1993:507388 HCAPLUS
DN 119:107388
ED Entered STN: 04 Sep 1993
TI Semiconductor device with active quantum well gate
IN Goronkin, Herbert; Shen, Jun; Tehrani, Saied; Zhu, X. Theodore
PA Motorola, Inc., USA

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 5221849	A	19930622	US 1992-899439	19920616
	JP 06120519	A2	19940428	JP 1993-135053	19930514
	JP 3173631	B2	20010604		
PRAI	US 1992-899439	A	19920616		

AB A field-effect semiconductor device, having multiple vertically stacked channels sepd. by independent gate electrodes, is provided where the channels are formed on a **wide** bandgap buffer layer and each channel is coupled to a drain electrode. Each channel is also coupled to a source electrode. The quantum well channels and quantum well gates are sepd. from each other by barrier layers of a **wide** bandgap semiconductor material. Materials are specified.

IT **106603-88-7**, Aluminum gallium antimonide ((Al,Ga)Sb)
RL: USES (Uses)
(**wide band gap** material, in semiconductor device with active quantum well gate)

RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 50 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1993:506689 HCAPLUS

DN 119:106689

ED Entered STN: 04 Sep 1993

TI Interband near-infrared second-harmonic generation with very large $|\chi(2)(2\omega)|$ in aluminum antimonide/gallium antimonide-indium arsenide antimonide/aluminum antimonide asymmetric quantum wells

AU Scandolo, Sandro; Baldereschi, Alfonso; Capasso, Federico

CS Inst. Romand. Rech. Numer. Phys. Mater., PHB-Ecublens, Lausanne, CH-1015, Switz.

SO Applied Physics Letters (1993), 62(24), 3138-40
CODEN: APPLAB; ISSN: 0003-6951

AB The authors propose a novel steplike quantum-well structure for 2nd-harmonic generation with very large $|\chi(2)(2\omega)|$ in the near IR, based on interband doubly resonant transitions. The structure is engineered so as to maximize the 2nd-order susceptibility $\chi(2)(2\omega)$, which requires, in particular, avoiding too much overlap between the heavy-hole and the lowest electron envelope functions. The choice of a steplike asymmetry and of GaSb-InAsSb compds., instead of the conventional AlGaAs, leads to an enhancement of the 2nd-order susceptibility by ~30 times with respect to bulk GaAs, at pump wavelengths of 1.5 μm.

IT **Energy** level, **band** structure
(of gallium antimonide-indium antimonide arsenide quantum wells, second harmonic generation in relation to)

IT **106603-91-2**, Antimony indium arsenide ((Sb,As)In)
(second harmonic generation in semiconductor quantum wells of gallium antimonide with)

RN 106603-91-2 HCAPLUS

CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

IT **25152-52-7**, Aluminum antimonide
RL: USES (Uses)
(second harmonic generation in structure of gallium antimonide-indium antimonide arsenide quantum well with)

RN 25152-52-7 HCAPLUS

CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

L41 ANSWER 51 OF 66 HCAPLUS

AN 1993:137271 HCAPLUS
DN 118:137271
ED Entered STN: 30 Mar 1993
TI Energy levels in quantum wells of nonparabolic semiconductors
AU Nag, B. R.; Mukhopadhyay, S.
CS Inst. Radio Phys. Electron., Calcutta Univ., Calcutta, 700 009, India
SO Physica Status Solidi B: Basic Research (1993), 175(1), 103-12
CODEN: PSSBBD; ISSN: 0370-1972
DT Journal
LA English
CC 76-3 (Electric Phenomena)
AB Energy eigenvalues are given for quantum wells of the GaAs/(Ga,Al)As, GaInAs/(Al,In)As, and InAs/(Ga,Al)Sb systems, for widths ranging between 0.5 and 20 nm. The **energy band** nonparabolicity is shown to affect the values significantly particularly for wells with widths of ~2 nm. The InAs/(Ga,Al)Sb wells have the lowest energy levels with odd parity because of the neg. effective mass in the barrier layer for **energies** below the mid-**gap energy**. Expts. are suggested for the **detection** of these levels.
IT **106603-88-7**
RL: USES (Uses)
(**energy** levels in quantum-well structures of, with indium arsenide)
RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 52 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1992:642018 HCAPLUS
DN 117:242018
ED Entered STN: 13 Dec 1992
TI Temperature dependence of **band-gap energy** of aluminum gallium antimonide (AlxGa1-xSb)
AU Kitamura, Noboru; Yamamoto, Hidetsugu; Wada, Takao
CS Dep. Electr. Eng., Suzuka Coll. Technol., Shiroko, 510-210, Japan
SO Materials Letters (1992), 15(1-2), 89-91
CODEN: MLETDJ; ISSN: 0167-577X
DT Journal
LA English
CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
AB AlxGa1-xSb liq.-phase epitaxial layers were grown at 400°. Photoluminescence (PL) measurements at various temps. were carried out on the epitaxial layers. The **energy** of the **band** edge emission was evaluated from PL measurements. The exptl. results were well fitted with the formula Eg = E0 - αT2/(T+β).
ST luminescence aluminum gallium antimonide band gap
IT **Energy** level, **band** structure
(of aluminum gallium antimonide epitaxial layers)
IT Luminescence
(of aluminum gallium antimonide epitaxial layers, **band-gap energy** in relation to)
IT **Energy** level, **band** structure
(**gap**, of aluminum gallium antimonide)
IT **106603-88-7**, Aluminum gallium antimonide
RL: PRP (Properties)
(luminescence study of epitaxial layers of, **band-gap energy** in relation to)
IT **106603-88-7**, Aluminum gallium antimonide
RL: PRP (Properties)
(luminescence study of epitaxial layers of, **band-gap energy** in relation to)
RN 106603-88-7 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0-1:1:0-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
Sb	1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 53 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1992:416944 HCAPLUS
DN 117:16944
ED Entered STN: 11 Jul 1992
TI Semiconductor planar avalanche **photodiode**
IN Tsuji, Masayoshi; Torikai, Toshitaka
PA NEC Corp., Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 04003474	A2	19920108	JP 1990-103809	19900419
PRAI	JP 1990-103809		19900419		

AB The **photodiode**, typically based on Group III-V semiconductors, comprises: (1) an intermediate and (2) an avalanche multiheterojunction layer, wherein (1) consists of (11) a 1st and (12) a 2nd semiconductor layer; (2) similarly consists of (21) and (22); the heterojunction interfaces of (1) and (2) are perpendicular to the substrate; (11) contacts with (21); the applied elec. field is parallel to the interfaces; and EA > EB > EC (EA, EB, EC = av. ionization energies of Group III elements in (21), (22), (11), resp.). The diode has a markedly improved avalanche yield and is suited for use in optical telecommunications.

IT Optical **detectors**
(semiconductor planar avalanche, contg. vertical heterojunction interfaces)

IT **Photoelectric** devices
(avalanche, semiconductor planar, contg. vertical heterojunction interfaces)

IT **25152-52-7**, Aluminum antimonide (AlSb) **51680-21-8**, Aluminum gallium arsenide antimonide ((Al,Ga)(As,Sb))
RL: PRP (Properties)
(semiconductor planar avalanche **photodiode** from)

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 54 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1992:201351 HCAPLUS
DN 116:201351
ED Entered STN: 16 May 1992
TI Effects of ordering on the band structure of III-V semiconductors
AU Teng, Dan; Shen, Jun; Newman, Kathie E.; Gu, Binglin
CS Phys. Dep., Univ. Notre Dame, Notre Dame, IN, 46556, USA
SO Journal of Physics and Chemistry of Solids (1991), 52(9), 1109-28
CODEN: JPCSAW; ISSN: 0022-3697
DT Journal
LA English
CC 65-3 (General Physical Chemistry)
AB The band structures of five types of ordered compds. derived from parent zincblende alloys A1-xBxC and AC1-xDx have been detd. Included in this study are two novel x = 1/4, 3/4 derived structures, luzonite and famatinite, and three x = 1/2 structures, chalcopyrite and two 1 × 1 superlattices oriented along the (0,0,1) and (1,1,1) directions. The theory combines an empirical tight-binding model for III-V compds. and a valence force-field model of strain. Strain-induced tetragonal and internal distortions as well as the spin-orbit interaction cause a splitting of the top of the valence band. Trends in this splitting and the band-gap variation are studied for the 18 combinations of III-V elements. The Hopfield quasicubic crystal-field model is found to accurately describe this splitting for all chalcopyrite compds. But this model fails for several (0,0,1)- and (1,1,1)-superlattice compds. contg. large strain distortions. The extd. Hopfield crystal-field splitting parameters Δef is found to scale linearly with tetragonal distortion for common-anion compds. ABC2, but follow curvilinearly internal distortion for common-cation compds. Strain and natural lineup **energy** modify the **band gap** significantly from that found in the virtual-crystal approxn. for the alloy. For the metastable alloy systems GaAs1-xSbx and GaP1-xSbx, the exptl. bowing of the band gap passes quite close to the results for the band gaps of the seven ordered structures.
IT **Energy** level, **band** structure
(of III-V semiconductors, effects of ordering on)
IT **107067-95-8 108915-73-7**, Antimony gallium arsenide (Sb0.5GaAs0.5) **108915-78-2**, Antimony indium arsenide (Sb0.5InAs0.5) **110832-09-2**, Antimony gallium arsenide (Sb0.75GaAs0.25) **117944-40-8 118320-40-4**, Antimony gallium arsenide (Sb0.25GaAs0.75) **118720-21-1 121871-91-8**, Antimony indium arsenide (Sb0.75InAs0.25) **137806-99-6 139738-69-5**, Antimony indium arsenide (Sb0.25InAs0.75)
RL: PRP (Properties)
(band structure of, effects of ordering on)
RN 107067-95-8 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.25:1:0.75) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.75	7440-55-3
Sb	1	7440-36-0
Al	0.25	7429-90-5

RN 108915-73-7 HCAPLUS
CN Antimony gallium arsenide (Sb0.5GaAs0.5) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
As	0.5	7440-38-2
Sb	0.5	7440-36-0

RN 108915-78-2 HCAPLUS
CN Antimony indium arsenide (Sb0.5InAs0.5) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.5	7440-38-2
Sb	0.5	7440-36-0

RN 110832-09-2 HCAPLUS
CN Antimony gallium arsenide (Sb0.75GaAs0.25) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
As	0.25	7440-38-2
Sb	0.75	7440-36-0

RN 117944-40-8 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.5:1:0.5) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.5	7440-55-3
Sb	1	7440-36-0
Al	0.5	7429-90-5

RN 118320-40-4 HCAPLUS
CN Antimony gallium arsenide (Sb0.25GaAs0.75) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	1	7440-55-3
As	0.75	7440-38-2
Sb	0.25	7440-36-0

RN 118720-21-1 HCAPLUS
CN Antimony, compd. with gallium and indium (1:0.75:0.25) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	0.25	7440-74-6
Ga	0.75	7440-55-3
Sb	1	7440-36-0

RN 121871-91-8 HCAPLUS
CN Antimony indium arsenide (Sb0.75InAs0.25) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.25	7440-38-2
Sb	0.75	7440-36-0

RN 137806-99-6 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.75:1:0.25) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.25	7440-55-3
Sb	1	7440-36-0
Al	0.75	7429-90-5

RN 139738-69-5 HCAPLUS
CN Antimony indium arsenide (Sb0.25InAs0.75) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.75	7440-38-2
Sb	0.25	7440-36-0

L41 ANSWER 55 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1992:49576 HCAPLUS
DN 116:49576
ED Entered STN: 08 Feb 1992
TI Electron velocity in indium phosphide single-heterojunction quantum wells
AU Bose, Devjani; Nag, B. R.
CS Inst. Radio Phys. Electron., Calcutta, 700 009, India
SO Semiconductor Science and Technology (1991), 6(12), 1135-40
CODEN: SSTEET; ISSN: 0268-1242
DT Journal
LA English
CC 76-3 (Electric Phenomena)
AB The velocity-field characteristic is calcd. for a single-heterojunction InP well which may be realized by using GaxAl1-xAsySb1-y as the barrier layer. The characteristic is detd. by the Monte Carlo method for the temps. of 300 K and 77 K. Characteristics of GaAs and Ga0.47In0.53As are also computed and compared with earlier calcns. and the calcd. characteristics of InP. The peak electron velocity in InP is about the same as in Ga0.47In0.53As or GaAs. The threshold field for intervalley transfer is, however, larger by a factor of 2.
ST electron velocity indium phosphide quantum well
IT Electron, conduction
(velocity of, in indium phosphide quantum wells)
IT **Energy** level, **band** structure
(**gap**, of aluminum gallium antimonide arsenide, with lattice matched to indium phosphide)
IT Semiconductor devices
(quantum-well, indium phosphide, with barrier of aluminum antimonide arsenide, electron velocity in)
IT **51680-21-8**, Aluminum gallium antimonide arsenide
RL: PRP (Properties)
(**band gap** of, with lattice matched to indium phosphide)
IT 122790-77-6, Aluminum antimony arsenide (AlSb0.44As0.56)
RL: PRP (Properties)
(electron velocity in indium phosphide quantum wells with barrier of)
IT 22398-80-7, Indium phosphide, properties
RL: PRP (Properties)
(electron velocity in quantum wells of, with aluminum antimonide arsenide barrier)
IT 1303-00-0, Gallium arsenide, uses 106097-59-0, Gallium indium arsenide (ga0.47in0.53as)
RL: USES (Uses)
(electron velocity in, for different elec. fields)
IT **51680-21-8**, Aluminum gallium antimonide arsenide
RL: PRP (Properties)
(**band gap** of, with lattice matched to indium phosphide)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 **ANSWER** 56 OF 66 HCAPLUS

AN 1992:32161 HCAPLUS
DN 116:32161
ED Entered STN: 24 Jan 1992
TI Electrical characteristics and **energy band** offsets in gallium antimonide-gallium aluminum antimonide (n-GaSb-p-Ga0.83Al0.17Sb)
AU Mebarki, M.
CS Inst. Phys., Univ. Oran, Oran, Algeria
SO Journal of Applied Physics (1991), 70(10, Pt. 1), 5420-2
CODEN: JAPIAU; ISSN: 0021-8979
DT Journal
LA English
CC 76-0 (Electric Phenomena)
AB p,nGa1-xAlxSb/GaSb heterojunctions obtained by liq.-phase epitaxy were studied by capacitance-voltage characterization and spectral **photoresponse.** The band offsets of this system are ΔEc = 0.14 ± 0.03 eV and ΔEv = 0.07 ± 0.03 eV, in agreement with other work. This preliminary study is used to propose a variation law of the electron affinity as a function of the compn. x.
ST **energy band** offset IIIA antimonide; gallium antimonide heterojunction band offset; aluminum gallium arsenide band offset
IT Photoconductivity and Photoconduction
(of gallium antimonide/gallium aluminum antimonide heterojunctions)
IT **Energy** level, **band** structure
(offset of, in gallium antimonide/gallium aluminum antimonide heterojunctions)
IT Electric capacitance
(potential relations with, of gallium antimonide/gallium aluminum antimonide heterojunctions)
IT 12064-03-8, Gallium monoantimonide
RL: USES (Uses)
(**energy band** offsets in heterojunctions of, with gallium aluminum antimonide)
IT **124696-85-1**
RL: USES (Uses)
(**energy band** offsets in heterojunctions of, with gallium antimonide)
IT **124696-85-1**
RL: USES (Uses)
(**energy band** offsets in heterojunctions of, with gallium antimonide)
RN 124696-85-1 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.17:1:0.83) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.83	7440-55-3
Sb	1	7440-36-0
Al	0.17	7429-90-5

L41 ANSWER 57 OF 66 HCAPLUS

AN 1991:546285 HCAPLUS
DN 115:146285
ED Entered STN: 05 Oct 1991
TI Optoelectronic devices
IN Esaki, Leo; Ohno, Hideo; Mendez, Emilio Eugenio
PA International Business Machines Corp., USA
SO Eur. Pat. Appl., 10 pp.
CODEN: EPXXDW
DT Patent
LA English

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 433542	A2	19910626	EP 1990-114315	19900726
	EP 433542	A3	19911227		
	EP 433542	B1	19950705		
	US 5079601	A	19920107	US 1989-453634	19891220
	JP 03191579	A2	19910821	JP 1990-217256	19900820
	JP 06054815	B4	19940720		
PRAI	US 1989-453634	A	19891220		

AB The title devices (e.g., light-emitting devices or **detectors**) comprise a quantum-well active region sandwiched between cladding electrode layes which may be sepd. from the active region by tunneling regions and/or potential barriers, the band edges of the layers are offset so that, under an appropriate bias, ≥1 of the energy states (of the quantum-well layer) which emitting or absorption transitions occur lie in the bandgap of electrode and within an allowed region in the other electrode. Preferably, 1 of the states lies in the conduction band of 1 of the electrodes and the other lies in the valence band of the other electrode. The devices exhibit improved carrier injection efficiencies relative to prior art devices and may be tuned (e.g., using an applied magnetic field).

IT Electroluminescent devices
Optical **detectors**
(quantum-well, band edge offsets in)

IT **25152-52-7**, Aluminum antimonide **51680-21-8**, Aluminum gallium arsenide antimonide
(optoelectronic devices contg.)

RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 59 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1991:195004 HCAPLUS
DN 114:195004
ED Entered STN: 17 May 1991
TI Optical characterization of silicon-doped indium arsenide antimonide grown on gallium arsenide and gallium arsenide-coated silicon by molecular-beam epitaxy
AU Dobbelaere, W.; De Boeck, J.; Van Mieghem, P.; Mertens, R.; Borghs, G.
CS Interuniv. Micro-Electron. Cent. VZW, Louvain, B-3001, Belg.
SO Journal of Applied Physics (1991), 69(4), 2536-42
CODEN: JAPIAU; ISSN: 0021-8979
DT Journal
LA English
CC 73-2 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 65, 76
AB Epitaxial layers of Si-doped InAs1-xSbx ave been grown by MBE on GaAs and GaAs-coated Si substrates. The absorption coeff. was measured in the 3-12 μm wavelength range and the exptl. data was fit by using an anal. expression that was derived from the Kane band model. The fitted value of the Fermi level was used to calc. the electron concn. and the results were compared with doping levels obtained from SIMS and Hall measurements.
IT Optical absorption
(of indium antimonide arsenide silicon-doped epitaxial layers, Fermi level in relation to)
IT Energy level, Fermi
(of indium arsenide antimonide silicon-doped epitaxial layers, optical detn. of)
IT **108915-77-1**, Indium antimonide arsenide (InSb0.7As0.3)
RL: PRP (Properties)
(optical **absorption** of silicon-doped, Fermi level in relation to)
RN 108915-77-1 HCAPLUS
CN Antimony indium arsenide (Sb0.7InAs0.3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.3	7440-38-2
Sb	0.7	7440-36-0

L41 ANSWER 60 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1990:413968 HCAPLUS
DN 113:13968
TI Absorption edge of the variable-bandgap epitaxial layers of indium arsenide antimonide (InAs1-xSbx, x≤0.54)
AU Zotova, N. V.; Losev, A. V.; Matveev, B. A.; Stus, N. M.; Talalakin, G.
SO Pis'ma v Zhurnal Tekhnicheskoi Fiziki (1990), 16(4), 76-80
CODEN: PZTFDD; ISSN: 0320-0116
LA Russian
AB An LPE method was used to grow, under conditions of high plasticity of the substrate (InAs), gradient layers InAs1-xySbxPy/InAs1-xSbx with the bandgap Eg .gtorsim. 90 meV. The absorption edge of such structures was of the type typical for A3B5 variable-bandgap semiconductors. The absorption coeff. was detd. at 300 K for hν = Egmin as α0 = 644 cm-1 (x = 0.54e, α0 = 1400 cm-1 (x = 0.15e, and α0 = 2000 cm-1 (x = 0.12).
IT **Energy** level, **band** structure
(**gap**, of indium arsenide antimonide epitaxial layers, optical absorption edge in relation to)
IT **111706-54-8**, Antimony indium arsenide (Sb0.15InAs0.85)
112802-08-1, Antimony indium arsenide (Sb0.12InAs0.88)
127577-47-3, Antimony indium arsenide (Sb0.54InAs0.46)
RL: PRP (Properties)
(optical **absorption** edge of epitaxial)
RN 111706-54-8 HCAPLUS
CN Antimony indium arsenide (Sb0.15InAs0.85) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.85	7440-38-2
Sb	0.15	7440-36-0

RN 112802-08-1 HCAPLUS
CN Antimony indium arsenide (Sb0.12InAs0.88) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.88	7440-38-2
Sb	0.12	7440-36-0

RN 127577-47-3 HCAPLUS
CN Antimony indium arsenide (Sb0.54InAs0.46) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.46	7440-38-2
Sb	0.54	7440-36-0

IT **127577-48-4**, Antimony indium arsenide (Sb0-0.54InAs0.46-1)
(optical **absorption** edge of epitaxy of)
RN 127577-48-4 HCAPLUS
CN Antimony indium arsenide (Sb0-0.54InAs0.46-1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.46 - 1	7440-38-2
Sb	0 - 0.54	7440-36-0

L41 ANSWER 61 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1989:487047 HCAPLUS
DN 111:87047
ED Entered STN: 03 Sep 1989
TI Avalanche multiplication in graded band gap structures
AU Arutyunyan, V. M.; Petrosyan, S. G.
CS Dep. Phys. Semicond. Dielectr., Yerevan State Univ., USSR
SO Infrared Physics (1989), 29(2-4), 681-4
CODEN: INFPAD; ISSN: 0020-0891
DT Journal
LA English
CC 73-12 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
AB Properties and peculiarities of avalanche multiplication in the p-i-n structures with the graded i-region are discussed. The grading of the band gap of semiconductors in the high field region of IR avalanche photoheterostructure governs the process of multiplication gain and improves noise characteristics of such **photodiodes**.
ST avalanche multiplication graded band gap
IT Semiconductor materials
(avalanche multiplication in graded band gap structures contg.)
IT **Energy** level, **band** structure
(**gap**, avalanche multiplication in graded)
IT 1303-00-0, Gallium arsenide, properties 37382-15-3, Aluminum gallium arsenide ((Al,Ga)As) **51680-21-8**, Aluminum gallium antimonide arsenide
RL: PRP (Properties)
(avalanche multiplication in graded **band gap** structures contg.)
IT **51680-21-8**, Aluminum gallium antimonide arsenide
RL: PRP (Properties)
(avalanche multiplication in graded **band gap** structures contg.)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

L41 ANSWER 62 OF 66 HCAPLUS

AN 1989:184365 HCAPLUS
DN 110:184365
ED Entered STN: 12 May 1989
TI Super-high-speed transistors
IN Muto, Shunichi
PA Fujitsu Ltd., Japan

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 63229752	A2	19880926	JP 1987-62633	19870319
PRAI	JP 1987-62633		19870319		

AB A super-high-speed semiconductor device has an InAs1-xSbx (x ≥ 0) base layer and an InAsGaSb-contg. barrier layer in its collector side. The barrier layer is a high potential barrier, therefore, the device has high withstand voltage between base and collector layers and can be driven at super high speed, even at room temp. A hot-electron transistor having a nondoped GaSb substrate, a n+/n/n-InAs0.9Sb0.1 collector/base/emitter structure, and a barrier layer of (InAsSb)0.53(Al0.5Ga0.5As)0.47 on the collector side had high thermal runaway resistance and high carrier mobility at room temp.

IT **108915-80-6**, Antimony indium arsenide (Sb0.1InAs0.9)
(base and collector and emitter layers of, of hot-electron transistor, large **energy gap** barrier layer in, for high thermal runaway resistance)
RN 108915-80-6 HCAPLUS
CN Antimony indium arsenide (Sb0.1InAs0.9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0.9	7440-38-2
Sb	0.1	7440-36-0

IT **106603-91-2**, Antimony indium arsenide ((Sb,As)In)
(mixed crystal with aluminum gallium arsenide, collector barrier layer of, of hot-electron transistor)
RN 106603-91-2 HCAPLUS
CN Antimony indium arsenide ((Sb,As)In) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
In	1	7440-74-6
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0

IT **117944-40-8**, Aluminum gallium antimonide (Al0.5Ga0.5Sb)
(mixed crystal with indium antimonide arsenide, collector barrier layer of, of hot-electron transistor)
RN 117944-40-8 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.5:1:0.5) (9CI) (CA INDEX

Component	Ratio	Component Registry Number
Ga	0.5	7440-55-3
Sb	1	7440-36-0
Al	0.5	7429-90-5

L41 ANSWER 63 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1989:16762 HCAPLUS
DN 110:16762
ED Entered STN: 06 Jan 1989
TI Bond statistics and their influence on materials properties of III-V quaternary alloys of type (AB)III(CD)V
AU Ichimura, Masaya; Sasaki, Akio
CS Dep. Electr. Eng., Kyoto Univ., Kyoto, 606, Japan
SO Journal of Electronic Materials (1988), 17(4), 305-10
CODEN: JECMA5; ISSN: 0361-5235
DT Journal
LA English
CC 76-3 (Electric Phenomena)
Section cross-reference(s): 65, 69
AB The relative nos., or statistics, of bonds in the III-V quaternary alloy semiconductors of the type (AB)III(CD)V are derived by a thermodn. anal. The results are represented by single variable, ζ, which is zero for the completely random atom arrangement. The calcn. is carried out for the entire compn. range for nine quaternary alloy systems. On the basis of the results, the effects of bond statistics on materials properties are investigated. The effects of $\zeta \neq 0$ can be evaluated by a linear interpolation procedure. The nonrandom atom arrangement has only a small influence on properties such as lattice const. and **energy band gap**, if the alloy is grown through a quasiequil. process.
IT **Energy** level, **band** structure
(**gap**, of Group IIIA pnictide semiconductors)
IT **51680-21-8**
RL: USES (Uses)
(bond statistics and thermodn. properties of semiconductor)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5

IT **25152-52-7**, Aluminum monoantimonide
RL: USES (Uses)
(semiconducting quaternary alloy contg., bond statistics of)
RN 25152-52-7 HCAPLUS
CN Aluminum, compd. with antimony (1:1) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Sb	1	7440-36-0
Al	1	7429-90-5

L41 ANSWER 64 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1989:16622 HCAPLUS
DN 110:16622
ED Entered STN: 06 Jan 1989
TI High pressure transport experiments in 3 dimensional systems
AU Aulombard, Roger Louis; Kadri, Abderrahmane; Zitouni, Karima
CS Groupe Etud. Semiconduct., USTL, Montpellier, 34060, Fr.
SO NATO ASI Series, Series B: Physics (1987), 152(Opt. Prop. Narrow-Gap Low-Dimens. Struct.), 299-312
CODEN: NABPDS; ISSN: 0258-1221
DT Journal
LA English
CC 76-1 (Electric Phenomena)
Section cross-reference(s): 65, 77
AB The 3-dimensional system characteristics were studied as a function of pressure for semiconductors. Some available literature data are reviewed and discussed. The effect of the hydrostatic pressure on transport properties and band structure is described. Some new data for Al0.07Ga0.93Sb, InSb, InAs and Ga0.78In0.22Sb are presented. The de Haas-Shubnikov effect, magnetoresistance, current carriers mobility were measured as a function of pressure.
IT De Haas-Shubnikov effect
Energy level, **band** structure
(in three dimensional semiconductors, pressure effect on)
IT **108892-50-8**, Aluminum gallium antimonide (Al0.07Ga0.93Sb)
RL: PRP (Properties)
(**energy band** structure for)
RN 108892-50-8 HCAPLUS
CN Aluminum, compd. with antimony and gallium (0.07:1:0.93) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0.93	7440-55-3
Sb	1	7440-36-0
Al	0.07	7429-90-5

L41 ANSWER 65 OF 66 HCAPLUS COPYRIGHT 2005 ACS on STN

AN 1987:525061 HCAPLUS
DN 107:125061
ED Entered STN: 05 Oct 1987
TI Band gaps and refractive indexes of aluminum gallium arsenide antimonide, gallium indium arsenide antimonide, and indium phosphide arsenide phosphide: key properties for a variety of the 2-4-μm optoelectronic device applications
AU Adachi, Sadao
CS Atsugi Electr. Commun. Lab., Nippon Telegr. and Teleph. Corp., Atsugi, 243-01, Japan
SO Journal of Applied Physics (1987), 61(10), 4869-76
CODEN: JAPIAU; ISSN: 0021-8979
DT Journal
LA English
CC 76-1 (Electric Phenomena)
Section cross-reference(s): 73
AB Methods for calcn. the material parameters in compd. alloys are discussed, and the results of AlxGa1-xAsySb1-y, GaxIn1-xAsySb1-y, and InPxAsySb1-x-y quaternaries lattice matched to GaSb and InAs are presented. These quaternary systems may provide the basis for optoelectronic devices operating over the 2-4 μm range. The material parameters considered are: the lattice const., the lower direct- and indirect-**gap energies**, and the refractive index. The model used is based on an interpolation scheme, and the effects of compositional variations are properly taken into account in the calcns. Key properties of the material parameters for a variety of optoelectronic device applications are also discussed.
IT **Energy** level, **band** structure
(**gap**, of Group IIIA pnictide solid solns.)
IT **51680-21-8**
RL: PRP (Properties)
(**band gap** and refractive index of)
RN 51680-21-8 HCAPLUS
CN Aluminum antimony gallium arsenide ((Al,Ga)(Sb,As)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ga	0 - 1	7440-55-3
As	0 - 1	7440-38-2
Sb	0 - 1	7440-36-0
Al	0 - 1	7429-90-5